

# THE PHILIPPINE JOURNAL OF SCIENCE

VOL. 67

OCTOBER, 1938

No. 2

## THE NUTRITION OF FILIPINO STUDENT OFFICERS

By IGNACIO E. VILLANUEVA\*

*Of the Magnolia Dairy Products Company, Manila*

Proper nutrition is necessary for health and efficiency. The present investigation is made on the nutrition of the student officers in the Reserve Officers Service School at Camp Henry T. Allen, Baguio, Mountain Province, Philippines.

Baguio is located at an elevation of nearly 5,000 feet and is very sanitary. It has a large, well-constructed market which is open every day. Fresh meats, fish, and many kinds of vegetables and fruits are usually on sale there.

During the week of October 9 to October 15, 1938, a study was made of the daily ration of the 174 student officers who ate at the Quezon Mess Hall. The average temperature of Baguio during this period was 16.6° C.

The weights and amounts of the food materials used daily for a period of seven days were recorded. The individual weights of the student officers were obtained from the Post Surgeon's Office. The average body weight of the students was 56.4 kilograms, and the distribution of body weights was as follows:

Percentage of students.	Average body weight. Kilos.
28.75	43-50
46.62	51-60
20.94	61-70
5.40	71-80
0.69	81-83

The maximum and minimum weights found were 83 and 43 kilograms respectively. The ages ranged from 22 to 46 years.

The results of this investigation are given in Tables 1 to 4.

\* Formerly on active duty as Probationary Third Lieutenant, Philippine Army Reserve.

TABLE 1.—*Individual food intake per day of Filipino student officers.*

Date.	Proteins.	Fats.	Carbo- hydrates.	Ash.	Fuel value
October, 1936	g.	g.	g.	g.	Calories.
9.	259	280	380	28	5,063
10.	160	238	304	19	4,885
11.	162	104	308	21	5,198
12.	148	136	351	25	5,118
13.	170	865	379	29	6,038
14.	20	60	145	12	2,711
15.	331	893	430	31	3,702
Total.	1,880	1,229	3,426	166	28,830
Average.	160	177	522	23	4,404

Table 1 shows that the average individual intake per day of the student officers was as follows: Proteins, 160 grams; fats, 177 grams; carbohydrates, 522 grams; with a fuel value of 4,404 calories. The average ash consumption was only 23 grams.

Table 2 shows that the individual food intake of the student officers is relatively high compared to the individual intake of foreign armies. Generally, when the necessary funds are available, the Filipino diet consists of rice, fish, meat, fruits, and vegetables. Milk, although a rich food, is used only by the very few who have the means to purchase it.

TABLE 2.—*The individual food intake of Filipino student officers compared with those of other organizations.*

Country	Proteins.	Fats.	Carbo- hydrates.	Calories.
	g.	g.	g.	
British Home Nations (1915).....	121.0	126.00	410.00	3,483
Canadian (1915).....	107.0	118.00	311.00	3,216
French Normal March (1918).....	136.0	98.00	467.00	3,601
Italian (1917).....	127.0	89.00	480.00	2,792
United States (1921).....	147.0	171.00	648.00	4,899
United States Training Camps.....	129.0	125.00	515.00	3,828
Philippine Constabulary <sup>a</sup> .....	116.9	14.25	370.41	3,721
Reserve Officers Service School.....	169.0	177.00	522.00	4,404

<sup>a</sup> Concepcion, L. *Philipp. Journ. Sci.* 62 (1937) 89. All other data, given in the table were taken from L. R. Martin and F. M. Hildebrandt, *Amer. Journ. Physiol.* 49 (1919) 531.

The protein intake was high, being 160 grams compared to 107 grams for the Canadians. The student officers had much more protein intake than those of the Philippine Constabulary (116.9 grams) as found by Concepcion. Fat was also very high,

about twice as much as the intake of the Philippine Constabulary and nearly six times as much as that of the Italians. The United States Army has the highest carbohydrate intake, 643 grams, with the Philippine Constabulary second and the student officers fourth. The Canadians have the lowest carbohydrate intake (344 grams). The diet of the Philippine student officers had a fuel value of 4,404 calories, next to that of the United States Army diet, which has 4,859. The Philippine Constabulary has a higher carbohydrate intake than have the student officers, but the latter exceed in proteins and fats, with a difference in fuel value of 673 calories.

The protein and fuel values per kilogram body weight, as compared with those given by Concepcion for the Philippine Constabulary, are shown in Table 3, which shows that the diet of the student officers has a higher fuel and protein value per kilogram body weight than the Constabulary and the United States Army Training Camps, with a difference of 12.03 and 20.80 calories for fuel values and 0.94 and 1.11 calories for proteins per kilogram body weight, respectively.

TABLE 3.—Average weight and protein and calorific value per kilogram body weight of Filipino student officers as compared with similar data for other organizations.

Organization.	Average weight.	Fuel value, in calories.		Protein, in calories.	
		Total.	Per kg.	Total.	Per kg.
Philippine Constabulary .....	55.8	3,731.51	67.47	116.9	2.11
United States Army Training Camp .....	66.1	3,888.00	58.7	219.8	1.91
Philippine Scouts .....	53.0	3,879.00	60.7		
Reserve Officers Service School .....	55.4	4,391.80	79.6	350.0	3.05

Table 4 shows the percentage distribution of nutrients in relation to calories as compared with the data obtained, and the recommendations made by previous investigators. In Table 4 33.82 per cent was the grain products and cereals consumption compared to 67.94 per cent found by Concepcion for the Constabulary rations. The results, however, are close to those of Rose for a moderate diet. Meat, fish, and eggs constitute more than twice the Constabulary ration and Concepcion's recommendation for low-cost diet. Milk and dairy products are very low, only 2.03 per cent. During the early days of training there was a large supply of milk, but when it was found that a financial deficit was likely to occur the milk was reduced in order

that the mess allowance could conform to the allowance for each student officer.

TABLE 4.—Percentage distribution of nutrients in relation to calories as compared with those recommended by previous workers.

Food materials.	Moderate (Rose).	Recom- mended by Concepcion for low- cost diet.	Concep- cion's Constab- ulary ration.	Reserve Officers Service School.
	Per cent.	Per cent.	Per cent.	Per cent.
Grain products or cereals.	38	54	61.81	53.92
Meat, fish, and eggs.	15	19	10.48	23.57
Milk and dairy products.	13	16	2.38	2.08
Fruits and vegetables.	15	17	7.48	16.69
Fatty foods and cereals.	27	13	1.68	16.16
Sugar and sweets.			6.4	
Miscellaneous.			8.16	3.51

The writer is in accord with the recommendations of Concepcion that an additional allowance be made for the student officers and the Constabulary to overcome the existing calcium and phosphorus deficiency in the diets of these organizations.

Although the percentage of fatty foods was much higher than recommended by Concepcion, it falls below the percentage recommended by Rose.

#### SUMMARY

A dietary study was made of the food served the Filipino Student Officers at the Reserve Officers Service School at Camp Henry T. Allen, Baguio.

This investigation was conducted for seven days.

There were 174 individuals of various body weights, with an average weight of 55.4 kilograms, and their ages ranged from 22 to 46 years.

The average individual intake per day as found was as follows: 169 grams proteins, 177 grams fats, 522 grams carbohydrates, 23 grams ash, and a fuel value of 4,404 calories.

When the officers do extensive muscular work and a greater fuel value is needed they should be given more carbohydrate foods.

More milk should be given to the officers. The importance of this food lies in the fact that it is a source of proteins, minerals, and vitamins.

Meat, fish, and eggs should be served as often as possible, provided they are cooked variably. The diet should be made palatable, efficient, and reasonably inexpensive.

As compared with that of other organizations, it appears that the food served at the Reserve Officers Service School in Baguio is of fair quality.

#### LITERATURE

- ADRIANO, F. T. The proximate chemical analyses of Philippine foods and feeding stuffs. *Philip. Agriculturist* 14 (1923) 57.
- ADRIANO, F. T., MANERTA MANANAN, and FRANCISCO BARRIO. The proximate chemical analyses of Philippine foods and feeding stuffs, II. *Philip. Agriculturist* 18 (1929) 119.
- ADRIANO, F. T., H. T. RAMOS, and LAURO YNALVEZ. The proximate chemical analyses of Philippine foods and feeding stuffs, III. *Philip. Agriculturist* 20 (1932) 530.
- ADRIANO, F. T., and M. S. DE GUZMAN. The proximate chemical analyses of some Philippine food products, IV. *Philip. Agriculturist* 20 (1932) 580.
- CONCEPCION, ISABELO. Nutritional requirement of Filipinos. *Journ. of Philip. Is. Med. Assoc.* (1) 13 (1933) 24.
- CONCEPCION, ISABELO. The nutritive value and cost of the Philippine Constabulary ration. *Philip. Journ. Sci.* 62 (1937) 89.
- HERNANDO, A. J. Food Values. *Bur. Sci. Pap. Bull.* 16 (1932).
- MARAFON, J. Nutritive mineral value of Philippine food plants (calcium, phosphorus, and iron contents). *Philip. Journ. Sci.* 56 (1935) 317.
- SANTOS, F. O., and F. T. ADRIANO. The Chemical composition of Philippine Food Materials. The Government of the Philippine Islands Dept. of the Interior, Office of the Public Welfare Commission, Manila (1929) 1.

# THE SYSTEMATIC POSITION OF SOME TREMATODES REPORTED FROM THE PHILIPPINES

By MARCOS A. TUBANGUI

*Of the Bureau of Science, Manila*

and

CARDINO M. AFRICA

*Of the School of Hygiene and Public Health, University of the  
Philippines, Manila*

THREE TEXT FIGURES

Among the trematodes reported from the Philippines by Tubangui (1933) and Africa and Garcia (1935) are some species the systematic status of which has been open to question. For this reason it was decided to study again their morphology so that their systematic relationships may be better established.

## Family MICROPHALLIDÆ Travassos, 1920

### Genus SPELOTREMA Jaegerskiöld, 1901

*SPELOTREMA BREVICÆCA* (Africa and Garcia, 1935) comb. nov. Text Fig. 1.

*Synonym.*—*Heterophyes brevicæca* Africa and Garcia, 1935.

This trematode is considered a dangerous parasite of man, its eggs having been found by Africa and his collaborators (1935, 1936, 1937) associated with lesions in the heart, brain, and spinal cord of persons who died of acute cardiac dilatation. Recently it was encountered by one of us (C. M. A.) in the intestine of a bird (*Sterna albifrons sinensis*).

The fluke presents several morphological features which are not encountered among the established members of the genus *Heterophyes* Cobbold. The examination of a large number of stained specimens has shown among other things the absence of a receptaculum seminis, and this fact alone would exclude the parasite from the family Heterophyidae, as the latter has been defined by Witenberg (1929). In that respect as well as in the location of the genital glands, the absence of a gonotyl, and the possession of short intestinal caeca, it resembles another group of flukes represented by the genera *Levinseniella* Stiles and Has-

sall, 1901, *Spelotrema* Jaegerskioeld, 1901, and *Spelophallus* Jaegerskioeld, 1908. The status of these three genera, which seem to differ from each other mainly in the structure of the terminal portions of the genitalia, does not appear to have been fully established; but relying on their being independent zoological units we refer the trematode in question to the genus *Spelotrema* because of its great similarity to the members of the latter.

The position of *Spelotrema* and related genera in the scheme of classification of the trematodes has been a matter of uncertainty. Some writers have classified them together with *Microphallus*, *Maritrema*, and *Monocæcum*, under the subfamily Microphallinae of the Heterophyidae; while others have removed these different genera from the heterophyids and placed them in a separate family, the Microphallidae. According to Mueller and Van Cleave (1932), however, "Until the detailed morphology of *Levinseniella*, *Spelotrema*, *Spelophallus*, *Monocæcum* and *Maritrema* has been determined as compatible with that of *Microphallus*, these genera should be excluded from the Microphallidae, though Poche (1926: 151) has attempted to relate them to the subfamily Microphallinae." Recently Rothschild (1937) studied the excretory system of a species of *Maritrema* and observed that it corresponds with that of *Microphallus* and allied genera. On the basis of our interpretation of the anatomy of *Spelotrema brevicæca* we have included *Spelotrema* in the family Microphallidae because it agrees with *Microphallus* in many important points, such as the absence of a gonotyl, a cirrus pouch, and a seminal receptacle, and the general plan of the main excretory system.

*Description.*—*Spelotrema*: Body pyriform to triangular in outline, thinner anteriorly than posteriorly, 0.5 to 0.7 by 0.3 to 0.4 millimeter; in preserved specimens dorsal surface convex, ventral surface concave, with acetabulum prominently elevated. Cuticle armed with scalelike spines from anterior end to posterior level of vitellaria. Oral sucker subterminal, 0.065 to 0.095 millimeter in diameter; acetabulum slightly larger than oral sucker, 0.080 to 0.105 millimeter across, at middle of body length or behind that level in well-extended specimens. Prepharynx very short, in most specimens practically absent; pharynx 0.032 to 0.034 by 0.034 to 0.043 millimeter; esophagus 0.08 to 0.09 millimeter long, with relatively thick walls but narrow lumen; intestinal caeca wide in diameter but short, only 0.15 to 0.19 millimeter long, not reaching posteriorly beyond middle

level of acetabulum. Genital pore near left margin of acetabulum, communicating with a small genital sinus.

Testes globular to oval, postovarial, 0.052 to 0.075 by 0.067 to 0.094 millimeter, with zones coinciding and fields widely separated, one on each side of body behind level of acetabulum, and more or less completely concealed in ventral view by anterior

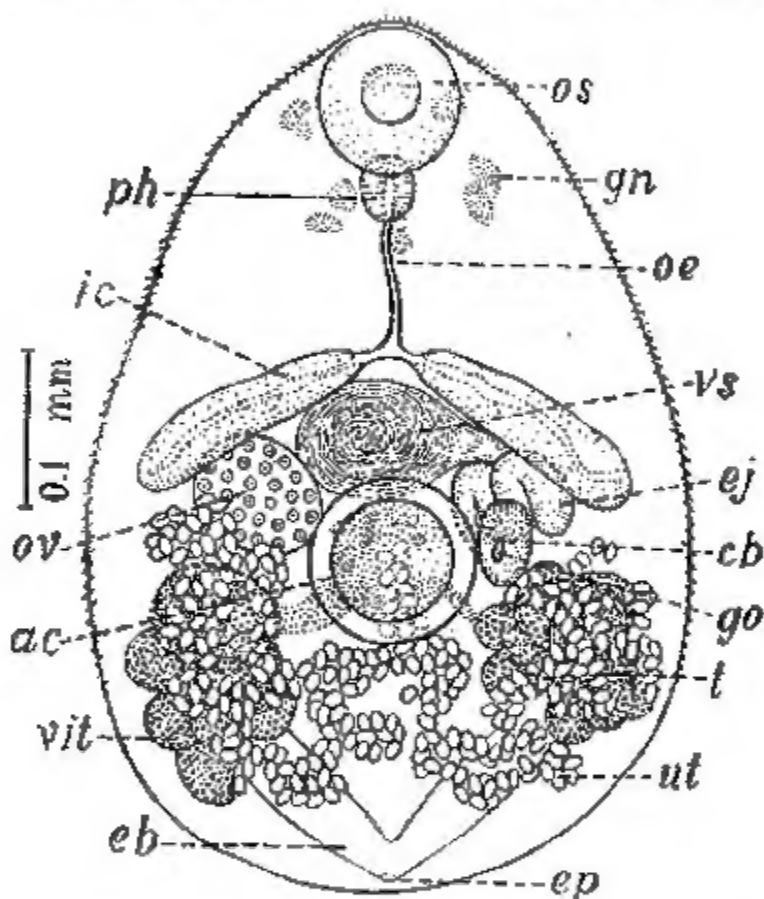


FIG. 1. *Spolotrema brevicauda* (Africa and Garcia, 1936). Entire worm, ventral view.

vitelline follicles and uterus. Seminal vesicle large, pyriform, 0.090 to 0.110 by 0.055 to 0.075 millimeter, crowded in between intestinal caeca and acetabulum and slightly overlapped by latter; in contracted specimens it is displaced posteriorly, dorsal to acetabulum. Seminal vesicle followed by a short prostate and then a long coiled ejaculatory duct which opens into a genital sinus through the apex of a muscular, cone-shaped body (kegel-



förmiger Körper) that measures 0.037 to 0.045 by 0.030 to 0.034 millimeter.

Ovary slightly oval, usually a trifle larger than testes, 0.052 to 0.098 by 0.067 to 0.105 millimeter, at or near middle of body length, on right side of median line, between acetabulum, right intestinal caecum, and right testis. Seminal receptacle absent. Uterus moderately long, loosely coiled, mostly postacetabular, its terminal portion (metraterm) opening into genital sinus near base of conical body and to left of male genital opening. Vitellaria prominent, mostly posttesticular, follicular, consisting of two groups of 7 to 9 (usually 8) oval to roundish follicles each. Small vitelline reservoir and shell gland median, immediately behind acetabulum. Eggs small, yellowish, operculated, 15 to 16 by 9.4 to 10 microns.

Excretory pore dorsoterminal at posterior end of body; excretory bladder V-shaped, its branches reaching anteriorly to level of acetabulum.

*Hosts*.—Man and the bird, *Sterna albigrons sinensis* Gmelin.

*Location*.—Intestines.

*Locality*.—Manila, Philippines.

Compared with the members of the genus *Spelotrema* listed by Jaegerskiöld (1908), the Philippine parasite appears to be most closely related to *Spelotrema similis*. It may be distinguished from the latter by its shorter oesophagus, greater number of vitelline follicles, and smaller eggs.

#### Family HETEROPHYIDÆ Odhner, 1914

##### Genus HETEROPHYOPSIS novum

HETEROPHYOPSIS EXPECTANS (Africa and Garcia, 1935) comb. nov. Text fig. 2.

*Synonym*.—*Heterophyes expectans* Africa and Garcia, 1936.

This trematode was originally reported from dogs. Recently it was found by one of us (M. A. T.) in the small intestine of a bird, *Fregata ariel ariel* (C. R. Gray), which was caught in Obando, Bulacan Province, Luzon, and obtained for dissection through the courtesy of Dr. C. Manuel, of the Fish and Game Administration Division of the Bureau of Science. By means of feeding experiments with young dogs, it was determined by Vasquez-Colet and Africa (1938) that the parasite utilizes several species of marine fishes as second intermediate hosts.

In their original description Africa and Garcia (1935) called attention to a number of morphological features which separate this fluke from the established members of the genus

*Heterophyes*; namely, the relative position of the testes, the location of the vitellaria and acetabulum, and the number of hooks found on the gonotyl. To these should be added the extent of the uterus which is not confined between the testes and the acetabulum, as is the case in members of the genus *Heterophyes*, but passes posteriorly beyond the testes to near the posterior end of the body; and the shape of the excretory bladder which has a long S-shaped stem. Instead of a short one as found in *Heterophyes*. We consider these differences to be of more than specific importance, and for this reason we propose the new genus *Heterophyopsis* for the trematode in question.

*Generic diagnosis.*—

**Heterophyidae:** Body elongate. Propharynx well marked; oesophagus very short or absent; intestinal caeca long, reaching to near posterior end of body. Acetabulum in anterior third of body length. Genital sac independent of ventral sucker, ministrual, alongside posteroexternal border of acetabulum; gonotyl disc-shaped, occupying the whole of genital sac and armed with a circle of serrated spines. Testes in posterior portion of body, in a straight line or one slightly obliquely behind the other. Ovary median, protesticular, equatorial. Seminal vesicle large, immediately behind genital sac, constricted into at least two portions. Seminal receptacle behind ovary. Uterus long, loosely coiled, between genital sac

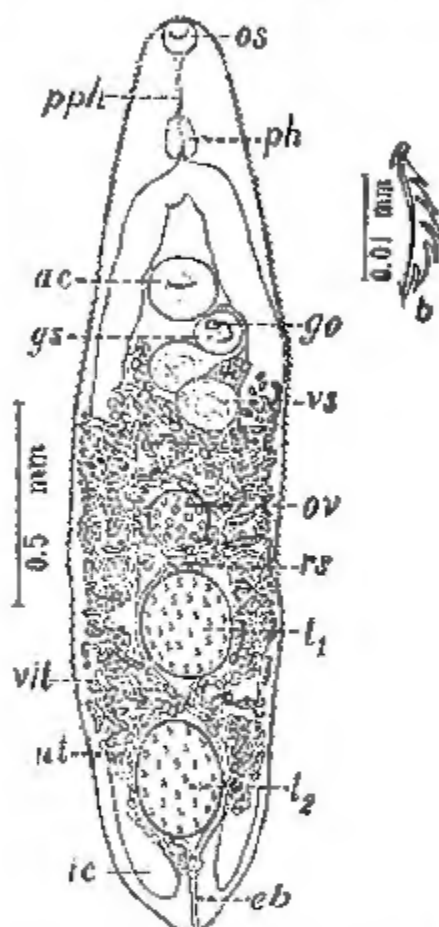


FIG. 2. *Heterophyopsis excretans* (Africa and Garcia, 1935). a, Entire worm, ventral view; b, one of the spines on the gonotyl.

and posterior end of body. Vitellaria mostly lateral, between seminal vesicle and second testis. Excretory bladder with a long S-shaped stem and two short branches. Adults in intestines of birds and mammals.

*Type species.*—*Heterophysalis expectans* (Africa and Garcia 1935).

*Description of type species.*—*Heterophysalis.* Body 1.5 to 2.2 millimeters in length by 0.3 to 0.5 millimeter in maximum width across ovary. Cuticular spines thick, set anteriorly, scantier after middle of body length, finally disappearing near posterior end. Oral sucker 0.06 to 0.09, acetabulum 0.11 to 0.17 millimeter in diameter, the latter at posterior portion of anterior third of body length. Prepharynx 0.11 to 0.27 millimeter long, pharynx 0.06 to 0.09 by 0.05 to 0.07 millimeter, esophagus from very short practically absent, to 0.06 millimeter long; intestinal caeca reaching to near posterior end of body.

Genital pore immediately behind acetabulum, to left side of median line at tip of gonotyl which measures 0.08 to 0.10 by 0.03 to 0.13 millimeter and is provided with a circle of serrated spines about 15 microns long.

Testes roundish to oval, median, postovarial, one immediately behind the other in a straight line or a little obliquely; anterior testis 0.12 to 0.27 by 0.12 to 0.22, posterior testis 0.13 to 0.29 by 0.11 to 0.22 millimeter. Seminal vesicle median prominent, constricted near middle of its length into two portions; prostate short; ejaculatory duct narrow, passing anteriorly around left border of genital sac, then bending posteriorly towards genital pore.

Ovary globular, median at or near middle of body length, 0.09 to 0.16 millimeter in diameter. Receptaculum seminis almost as large as ovary when well distended with spermatozoa median or sometimes displaced to either side of median line. Uterus moderately long. Vitellaria consisting of irregularly shaped follicles arranged in two lateral bands and extending from level of seminal vesicle to as far as middle level of second testis. Transverse vitelline ducts meeting dorsal to ovary to form a small vitelline reservoir. Shell gland dorsal to ovary and slightly anterior to it. Eggs oval, yellowish thick-shelled, with a slight "shouldering" at opercular end, 22.5 to 26.3 by 14 to 18 microns.

Excretory pore terminal at posterior end; excretory bladder with a long S-shaped stem which divides into two short branches behind ovary.

*Hosts*.—Dog and the bat, *Frogata aeneo-ardet* (C. R. Gray)

*Location*.—Small intestine.

*Localities*.—Manila, Olongapo, Bulacan Province, Luzon.

Genus *GALACTOSOMUM* Looss, 1899

*GALACTOSOMUM ANGUILLARUM* (Tubangua, 1933) comb. nov. Text fig. 1

*Synonym*.—*Haplorenchis anguillarum* Tubangua, 1933

Chen (1936) has called attention to the systematic status of this trematode which, according to him, does not belong in the genus *Haplorenchis* Looss, 1899. A reexamination of the original side and its comparison with the different members of the family Heterophyidae has shown that Chen is correct in his contention and that the parasite has closer affinity with species of the genus *Galactosomum* Looss, 1899, than with those of *Haplorenchis*.

It may be of interest to note that *Galactosomum anguillarum* is the second sexually immature heterophyid to be recorded from the intestines of fishes, the other one being *Apophallus americanus* Van Cleave and Mueller, 1932. Although Mueller and Van Cleave (1932) have described a number of adult heterophyids belonging to distinct genera from fishes, it is doubtful if species of *Galactosomum* and *Apophallus* can develop into full maturity in this group of hosts.

*Description*.—*Galactosomum*. Body elongate, 2.9 by 0.56 millimeters. Cuticle armed with numerous small spines from anterior end to level midway between second testis and posterior end of body. Oral sucker 0.15 by 0.18 millimeter, acetabulum absent. Pharynx 0.54 millimeter long, gyoxy 0.14 by 0.16 millimeter, esophagus 0.18 millimeter long, intestinal caeca reaching to about 0.2 millimeter from posterior end of body.

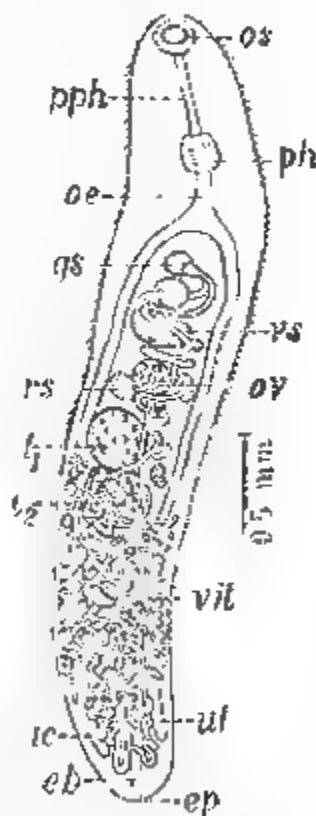


FIG. 1. *Galactosomum anguillarum* (Tubangua, 1933) Mature, ventral view.

Genital pore median, behind esophageal bifurcation, at junction of anterior and middle thirds of body length. Genital sac occupied wholly by pyriform gonotyl measuring 0.10 by 0.13 millimeter and armed with five stout hooks.

Testes roundish in outline, postovarial, one immediately but somewhat obliquely behind the other; anterior testis 0.28 posterior testis 0.24 millimeter in diameter. Seminal vesicle median, between gonotyl and ovary, 0.42 by 0.13 millimeter, bent and constricted at anterior third of its length into two unequal portions. Prostate short, followed by equally short ejaculatory duct.

Ovary median slightly oval and compressed, immediately pre-equatorial, 0.14 by 0.17 millimeter. Oviduct arising from posterior border of ovary. Receptaculum seminis well developed, immediately behind ovary and to right side of median line. Vitellaria moderate, meeting in median line and extending from posterior level of first testis to in front of blind ends of intestinal caeca. Vitelline reservoir and shell gland behind ovary alongside seminal receptacle. Uterus moderately long, mostly posttesticular, arranged in short descending and ascending coils, and reaching posteriorly beyond terminations of caeca. No eggs present.

Excretory pore posteroterminal; excretory bladder Y-shaped.

*Host*.—*Anguilla mauritiana* (Bennet)

*Location*.—Intestine

*Locality*.—Palo, Leyte

#### REFERENCES

- AFRICA, C. M., and E. Y. GARCIA. Heterophyid trematodes of man and dogs in the Philippines with descriptions of three new species. *Philipp. Journ. Sci.* 57 (1935), 253-267.
- AFRICA, C. M., E. Y. GARCIA, and W. DE LEON. Intestinal heterophyidiasis with cardiac involvement: a contribution to the etiology of heart failure. *Philipp. Journ. Publ. Health* 2 (1935) 1-22.
- AFRICA, C. M., W. DE LEON, and E. Y. GARCIA. Heterophyidiasis. IV. Lesions in the myocardium of eleven infested hearts including three cases with valvular involvement. *Philipp. Journ. Publ. Health* 3 (1936) 1-27. V. Ova in the spinal cord of man. *Philipp. Journ. Sci.* 62 (1937) 393-399.
- CHEN, H. T. A study of the Haploporhinae (Looss, 1899) Poche 1926 (Trematoda: Heterophyidae). *Parasit* 28 (1936) 40-55.
- JAKSCHITSCH, L. A. Kleine Beitrage zur Kenntnis der Vogeltrematoden. *Contrib. Biol. Bakteriol. Parasitenk. Infektionskr. 1. Abt. Orig.* 48 (1908) 302-317.

- Looss, A. Weitere Beiträge zur Kenntniss der Trematoden-Fauna Aegyptens. Zool. Jahrb. Syst. 12 (1895) 521-784.
- MUELLER, J. F., and H. J. VAN CLEAVE. Parasites of Oneida Lake fishes, II. Descriptions of new species and some general taxonomic considerations, especially concerning the trematode family Heterophyidae. Roosevelt Wild Life Annals 3 (1932) 79-137.
- ROTHSCHILD, M. Note on the excretory system of the trematode genus *Maritrema* Nudolt, 1907, and the systematic position of the *Microphallinae* Ward, 1901. Ann. & Mag. Nat. Hist. X 19 (1937) 235-265.
- TUBUNGUI, M. A. Trematode parasites of Philippine vertebrates, VI. Descriptions of new species and classification. Philip. Journ. Sci. 52 (1933) 167-197.
- VAN CLEAVE, H. J., and J. F. MUELLER. Parasites of the Oneida Lake fishes, I. Descriptions of new genera and new species. Roosevelt Wild Life Annals 3 (1932) 9-71.
- VASQUEZ-COLET, A., and C. M. AFRICA. Determination of the precise intermediate hosts of Philippine heterophyid trematodes by feeding experiments. Philip. Journ. Sci. 45 (1938) 293.
- WITENBERG, G. Studies on the trematode family Heterophyidae. Ann. Trop. Med. and Parasit. 23 (1929) 131-229.

## ILLUSTRATIONS

### TEXT FIGURES

[Abbreviations: ac, Acetabulum; pb, penis-shaped body (genital papilla); sb, secretory bladder; ej, ejaculatory duct; cp, caecum; pa, nerve ganglion; gn, genital opening; ps, genital sac; ie, intestinal caecum; es, esophagus; os, oral sucker; ov, ovary; ph, pharynx; pp, propharynx; re, seminal receptacle; t, testis; ut, uterus; cd, vitelline glands; va, seminal vesicle.]

FIG. 1. *Spotostrema brevicaudum* (Aitken and Garcia, 1936) Entire worm, ventral view.

2. *Heterophyopsis expectata* (Africa and Gutera, 1935) a, Entire worm, ventral view b, one of the spines on the gonostyl.

3. *Galactomorphum anguillarum* (Tobian, 1933) Entire worm, ventral view.

## NEW OR LITTLE-KNOWN TIPULIDÆ FROM EASTERN ASIA (DIPTERA), XL

By CHARLES P. ALEXANDER  
Of Andover, Massachusetts

THREE PLATES

The crane flies discussed in the present report are all from northern Korea (Chosen), where they were collected by Mr. Alexander Yankovsky, well-known entomologist and naturalist. The materials included are from a variety of localities that may be grouped under the following four major categories:

OMPO, altitude 120 to 2,000 feet; average, 600 to 800 feet.

MOUNT CHONSAN (Chonsan), Paikusan, on the border of Manchuria, altitude 3,000 to 5,100 feet, July 12 to 26, 1937.

SEREN MOUNTAINS, 30 miles above the Ompo River, altitude 2,100 to 5,200 feet.

YANCHEN LAKE, 80 miles northeast of Ompo, altitude 30 to 60 feet.

I wish to express my very deep gratitude to Mr. Yankovsky for the time and care that he has devoted to the collecting of the Korean Tipulidæ. All types are preserved in my collection of these flies. I am including in this report a few species of the families Tanyderidæ and Trichoceridæ, commonly called crane flies though not belonging to the restricted family Tipulidæ.

### TANYDERIDÆ

*PROTANYDERUS YANKOVSKYI* sp. nov. Plate 1 fig. 1

Large (wing, 14 millimeters or more); antennal flagellum yellow; mesonotal proscutum gray, with four poorly defined more brownish stripes; scutellum testaceous yellow; knobs of halteres dark brown; femora yellow, tips blackened, tibia and tarsi black; wings whitish subhyaline with four brown crossbands, the three outer crossbands interconnected by the uniformly brown cell  $R_4$ , abdomen with basal five segments brown or yellowish brown, the outer segments, including male hypopygium, black, dististyle of male hypopygium simple.

*Male*.—Length about 13 millimeters; wing, 14.

*Female*.—Length, about 13 millimeters; wing, 14.5.



Rostrum black a little shorter than remainder of head not including the brown perfect labial palpi; maxillary palpi black. Antennae relatively short, 18-segmented, scape dark brown, pruinose; pedicel dark, flagellum yellow; flagellar segments cylindrical, longest verticils a little exceeding segments. Head gray, a low darkened tubercle on anterior vertex behind antennal fossa; posterior vertex a little darker.

Cervical sclerites dark brown. Pronotum gray. Mesonotal praescutum gray with four poorly defined, more brownish stripes, setigerous punctures of interspaces somewhat conspicuous, scutal lobes darkened, pruinose, median area and scutellum testaceous yellow, parascutella dark; medioergate brown. Pleura chiefly dark brownish gray, variegated by paler gray. Halteres with stem yellow knob dark brown. Legs with coxae and trochanters yellow; femora yellow, tips passing into black, a little more extensive on fore femora where it includes about distal fifth, tibiae and tarsi black. Wings (Plate 1, fig. 1) with ground color whitish subhyaline, prearcular and subcostal fields more cream-yellow; a very heavy brown pattern, distributed as follows: Cell C; four complete crossbands, the first postarcular, including basal portion of cell Cu and axillary region of anal cell; second band at cord, widened posteriorly in cells Cu and A; third band at level of fork of  $R_{2+3}$  and outer end of cell 1st  $M_2$ , more expanded at posterior border, last band apical involving cells Sc to M, inclusive; cell R, uniformly darkened, interconnecting the three outer crossbands, a major isolated dark area at origin of  $R_5$  and adjoining portion of cell Sc, a small marginal spot at end of vein  $M_1$ , veins yellow, darker in corded areas. Venation. Cell R subcostal in length to its cell, cell 1st  $M_2$  longer than any of veins beyond it.

Abdomen with basal five segments brown to yellowish brown; remaining segments, including male hypopygium, black, ovipositor small, orange. Male hypopygium with dististyle relatively long and slender, gradually narrowed outwardly.

*Habitat*.—Northern Korea.

Holotype male Chosam, Paikusan, altitude 4,300 feet, July 12, 1937 (Yankovsky). Allotype, female.

I name this striking species in honor of the collector, Mr. Alexander Yankovsky. The fly is very distinct from the five other members of the genus so far made known. The four Asiatic species of *Prantanierns* may be separated by the following key.

Key to Asiatic species of *Protaenidæ*

- 1 Very large (wing, 14 millimeters or more), wings with four brown crossbands, second crossband at cord to fourth, at apex intersected by uniformly darkened cell R<sub>1</sub> (northern Korea)

*P. yonko skyi* sp. nov.

Small (wing, under 10 millimeters); wings with crossbands, if present, narrow, not interconnected along cell R<sub>1</sub>, interspaces, especially cell C, broken by additional spots and dots

- 2 Very small (wing, male about 6.5 to 7 millimeters), wing pattern chiefly dotted and spotted, including a series of spots in cell M adjoining vein Cu (Turkistan) *P. heckeri* (Riedel)

Larger (wing, male, about 8 to 9 millimeters), wing pattern cross-banded, interspaces with restricted dots and spots, dark area at origin of R<sub>1</sub> interconnected across cell M with darkened cloud in cells Cu and A, forming a complete oblique crossband near wing base; a continuous dark band along vein Cu, connecting basal and dark female

- 3 Wings (male) narrow, not conspicuously widened opposite termination of vein A; cells M<sub>2</sub> and 2d M at margin moderately wide, subequal, cell M<sub>1</sub>, areagus with median branch much smaller than others, subtriangular (Japan, Manchuria) *P. caskia* Alexander

Wings (male) broad, especially opposite termination of vein A, cells M<sub>1</sub> and 2d M<sub>2</sub> very wide at margin, much more extensive than cell M<sub>2</sub>, areagus with of three branches subequal and subequal (Japan, Manchuria) *P. alexandri* Kariya

## TRICHO CERIDÆ

TRICHO CERIDÆ TIBETÆ. LEPID. no. nov. Plate 1, fig. 2. Plate 2, fig. 12.

Belongs to major group; general coloration of mesonotum reddish brown, prepectum with a broad darker brown, median stripe that is more or less divided by a central pale vitta; legs dark brown; wings with a strong brown tinge, stigma slightly darker, abdomen dark brown, male hypopygium with ventromedian lobes of basistyles not forming a continuous bridge; dististyle with a strong lobe on mesal face at base; gonapophyses fused into a depressed median prothoracic, lateral horns strongly divergent

Male—Length about 7 to 7.3 millimeters, wing, 8 to 8.5

Female—Length, about 7.5 millimeters, wing 8.5.

Rostrum dark brown; palpi, black. Antennæ black, pedicel of scape yellow. Head dark brownish gray; vertex broad

Mesonotum pale reddish brown, sparsely pruinose, with a broad, darker brown to brownish black median stripe that is more or less completely split by a central pale vitta; posterior sclerites of notum paler brown to brownish yellow. Pleura pale brown. Halteres dark brown, base of stem restrictedly yellow

Legs with coxae obscure yellow, base of fore coxae more darkened; trochanters yellow, remainder of legs dark brown. Wings (Plate 1, fig. 2) with a strong brown tinge, the slightly darker stigma lying beyond level of  $R_{1+2}$ , prearcular field a little brighter, veins dark brown. Venation:  $R_{3+4}$  subequal to or a little shorter than  $R_{5+6}$ .

Abdomen dark brown throughout. Male hypopygium (Plate 2, fig. 25) with ventromesal lobes of basistyles *b*, not forming a continuous bridge, touching at midline. Dististyle, *d*, of moderate length, with a low conspicuous tubercle on mesal face at base. Gonapophyses fused into a depressed median phallosome, *p*, as in the group, lateral horns strongly divergent, apex between horns gently convex. Ovipositor with cerci of moderate length, relatively slender, especially on distal half.

*Habitat.*—Northern Korea.

Holotype, male, Seren Mountains, altitude 5,000 feet, October 3, 1937 (Yankovsky). Allotopotype, female. Paratopotypes, 2 males.

I propose the name *major* for the group of species having the gonapophyses fused into a single depressed-flattened median plate, with their apices protruding laterad or caudad as strong horns. In the majority of species in this group the ventromesal lobes of the basistyles are fused at midline to form a continuous bridge. Three of the species, *Trichocera major* Edwards (northern Europe), *T. longisetosa* Alexander (western United States) and *T. setosirena* Alexander (Alaska) have simple dististyles, while *T. sibirica* Edwards (northern and northeastern Asia) and *T. bituberculata* Alexander (Alaska) each have two unusually conspicuous lobes on each dististyle. The present fly is readily told from all these allied forms by possessing a single small basal tubercle on the relatively short dististyle.

*TRICHOCEIRA SIBERICA* Edwards

*Trichocera sibirica* EDWARDS, Ann. & Mag. Nat. Hist. IX 5 (1920) 431.

The unique type, a male, was from Vershininsk, Yenesei River, Siberia, 69° 3' north latitude, some 3,000 miles northwest of the station here recorded. Seren Mountains, northern Korea, altitude 5,000 feet, October 3, 1937 (Yankovsky), males and females. The female, characterized here as allotype, differs from the male only in sexual characters. The ovipositor has the cerci relatively elongate, only gently curved, the ventral edge nearly straight, the dorsal margin very gently curved.

**TRICHOCEBA MIRABILIS** Alexander.

*Trichocera mirabilis* ALEXANDER, Philip. Journ. Sci. 95 (1934) 20, 21.

The types were from Kongo San, Korea, taken in October by Machida. NORTHERN KOREA, Yanchen, altitude 40 feet, October 6, 1937. OMPHO, altitude 600 feet, November 17, 1937. SEREN MOUNTAINS, altitude 1,800 feet, October 13, 1937 (Yankovsky).

**TRICHOCEBA LATILOBATA** sp. nov. Plate 1, fig. 3; Plate 2, fig. 26.

General coloration dark blackish gray, praescutum with two still darker submedian stripes; legs brownish black; wings grayish subhyaline, prearcular field more whitened; stigma and a small cloud on r-m pale brown;  $R_{2+3+4}$  longer than  $R_{2+3}$ ; abdomen, including hypopygium, brownish black; male hypopygium with bridge of basistyles entire; dististyle relatively short and flattened, on mesal face beyond base with a broad-based triangular lobe.

*Male*.—Length, about 5 millimeters, wing, 5.5.

Rostrum and palpi black. Antennae black, outer segments paler. Head brownish black.

Mesonotal praescutum dark blackish gray with two still darker submedian stripes, posterior sclerites of notum blackened, sparsely pruinose, posterior border of scutellum somewhat paler. Pleura brownish black, including dorsopleural membrane. Halteres infuscated, base of stem yellow. Legs with fore coxae brownish black, middle coxae testaceous, hind coxae yellow; trochanters yellow, remainder of legs brownish black, extreme femoral bases yellow. Wings (Plate 1, fig. 3) grayish subhyaline, prearcular field more whitened; stigma and a small cloud on r-m pale brown, veins brown. Venation:  $R_{2+3+4}$  longer than  $R_{2+3}$ , vein 2d A somewhat angularly bent on distal third.

Abdomen, including hypopygium, brownish black. Male hypopygium (Plate 2, fig. 26) with ventromesal lobes of basistyles, *b*, forming a continuous bridge. Dististyle, *d*, relatively short and flattened, on mesal face beyond base with a broad-based triangular lobe. Gonapophyses, *g*, long and slender.

*Habitat*.—Northern Korea.

*Holotype*, male, Ompo, altitude 650 feet, August 11, 1937 (Yankovsky).

*Trichocera latilobata* is readily told from the other described species of the genus by the continuous bridge of the basistyles, in conjunction with the position and shape of the lobe on the mesal face of the dististyle. In other species with a simple lobe

on the mesal face of the dististyle, this is much smaller and nearly basal in position

## TIPULIDÆ

### LIMONIIDÆ

#### LIMONINI

LIMONIA (LIMONIA) VENERABILIS sp. nov. Plate 1, fig. 4 Plate 2, fig. 27

General coloration black; antennae black throughout; halteres brownish black, base of stem pale yellow, femora pale brown, narrowly blackened close to tips; tibiae and tarsi black; wings with a brownish tinge, oval stigma darker brown;  $R_{2+3}$  subequal to  $R_{4+5}$ ; abdomen brownish black, caudal margins of segments narrowly paler; male hypopygium with ninth tergite very extensive, mesal-apical lobe of gonapophysis unusually long and slender, gently curved, tips a little expanded, terminating in a black spine.

Male.—Length, about 10 millimeters; wing, 10

Rostrum and palpi black. Antennae black throughout; flagellar segments passing through oval to elongate cylindrical, with unusually long verticils. Head dark gray, anterior vertex moderately wide, about twice diameter of scape.

Pronotum brownish black, with coarse erect setae. Mesonotal premesothorax and scutum black, setae of interspaces sparse but long and conspicuous, median area of scutum and scutellum paler than remainder; postnotum black, heavily pruinose. Pleura black, sparsely pruinose; dorsopleural membrane dark. Halteres brownish black, base of stem pale yellow. Legs with fore coxae black, midcoxae brown, posterior coxae brownish yellow; trochanters yellow, femora pale brown, narrowly brighter basally, narrowly blackened close to tips, extreme apices pale; tibiae and tarsi black; claws long, with an elongate median spine and smaller, more basal teeth. Wings (Plate 1, fig. 4) with a brownish tinge, stigma oval, darker brown, outer radial cells vaguely darker than remainder of ground, cord narrowly and insensibly darker, a dark cloud along vein Cu, veins brown, paler in preapical field. Venation. Sc, ending about opposite one-third length of  $R_5$ .  $Sc_2$  longer;  $R_{2+3}$  subequal to  $R_{4+5}$ , m-cu at fork of M.

Abdomen brownish black, caudal borders of sternites paler, obscure yellow, caudal borders of tergites more narrowly and less distinctly so; hypopygium black, tips of dististyles yellow. Male hypopygium (Plate 2, fig. 27) with tergite, 9d, unusually

extensive, divided into three parts by longitudinal lines, median section with caudal border very weakly emarginate. Basistyle, *b*, with ventromesal lobe low. Dististyle, *d*, with basal half darkened, moderately enlarged, with long coarse setæ, distal half narrowed, yellow. Gonapophysis, *g*, with mesal apical lobe unusually long and slender, gently curved, tips a little expanded, terminating in a black spine. Edcagus, *e*, narrow, terminating in two short divergent points, surface with microscopic acute spicules, more concentrated down median line.

*Habitat*.—Northern Korea.

Holotype, male, Ompo, altitude 600 feet, June 23, 1937 (Yankovsky).

*Limonia* (*Limonia*) *venerabilis* is most similar to *L.* (*L.*) *pudata* Alexander and *L.* (*L.*) *tristis* Alexander, differing in the coloration, details of venation, and the structure of the male hypopygium, especially the unusually long slender lobe of the gonapophysis.

*LIMONIA* (*DICRANOMYIA*) *MESOSTERNATA* (Alexander)

*Dicranomyia mesosternata* ALEXANDER, Ann. Ent. Soc. America 12: 19 (1919) 329, 330.

Northern Korea, Ompo, altitude 700 to 900 feet, October 26, 1937 (Yankovsky).

*LIMONIA* (*DICRANOMYIA*) *HYPERA* (Alexander).

*Dicranomyia hypera* ALEXANDER, Phila. Journ. Sci. 24 (1924) 544, 545.

Northern Korea, Ompo, altitude 120 to 160 feet, June 9 to 15, 1937 (Yankovsky). The type was from Saghalien.

*LIMONIA* (*DICRANOMYIA*) *INFUSA* sp. nov. (Plate I, fig. 3; Plate X, fig. 23).

General coloration obscure brownish yellow, praescutum with three darker brown stripes, antennæ dark brown; pleura yellow; valteres pale, knob darkened at apex; femora yellow, tips very narrowly blackened; tibiae yellow, extreme base narrowly darkened; wings cream-yellow, with a relatively heavy dark pattern, including four costal areas, last at stigma; Sc, far removed from the tip of Sc<sub>1</sub> at near midlength of vein Sc; m-cu shortly before fork of M; abdominal tergites brownish black, sternites obscure yellow, male hypopygium with rostral spines two placed close together on short stout prolongation.

*Male*.—Length, about 0.5 to 2 millimeters; wing 7 to 9.

Rostrum brown; palpi black. Antennæ dark brown; flagellar segments oval, incisures well marked; two last segments sub-

equal in length. Head dark brownish gray, paler behind; anterior vertex moderately wide.

Mesonotal praescutum obscure brownish yellow, with three darker brown stripes, in cases the surface more heavily pruinose to obscure these stripes; scutal lobes darkened median area abruptly paler, more pruinose, scutellum darkened medially, paler on sides; mediotergite darkened. Pleura yellow, more pruinose in more heavily patterned specimens, somewhat darker along suture between anepisternum and sternopleurite. Halteres pale, apex of knob darkened. Legs with coxae and trochanters pale; femora yellow, tips very narrowly but conspicuously blackened, the amount subequal on all legs; tibiae yellow, bases very narrowly darkened, tarsi yellow, outer segments passing into black. Wings (Plate 1, fig. 5) cream-yellow, heavily patterned with brown, including four costal areas, last largest, at stigma, confluent with a seam along cord, third area large, involving both tip of Sc and origin of Rs; second major area at Sc<sub>2</sub>; basal area smallest; cord and outer end of cell 1st M<sub>2</sub> narrowly seamed with brown; wing tip in outer radial field very narrowly and insensibly seamed with brown; veins yellow, darker in clouded areas. Venation Sc<sub>1</sub> ending opposite or just beyond origin of Rs, Sc<sub>2</sub> far from its tip, at near mid-distance between arculus and origin of Rs; m-cu shortly before fork of M<sub>1</sub>, cell 2d A wide.

Abdominal tergites brownish black, sternites obscure yellow to brown; hypopygium yellow. Male hypopygium (Plate 2, fig. 28) with caudal margin of tergite, 9<sup>th</sup>, emarginate, lobes obtusely rounded. Ventromesal lobe of basistyle, *b*, subglobular, darkened. Dorsal dististyle strongly curved, tip narrowed. Ventral dististyle, *cd*, subglobular, rostral prolongation short and stout; two rostral spines of moderate length placed close together. One paratype specimen showing three rostral spines on one style only, evidently an abnormality of the specimen. Gonapophysis, *g*, with mesal-apical lobe curved, tip acute.

*Habitat*.—Northern Korea

Holotype, male Seren Mountains, a titude 2,500 feet, October 3, 1937 (Yankovsky). Paratopotypes, 6 males.

*Limonia* (*Diceranomyia*) *infusa* is most generally similar to *L. (D.) didyma* (Meigen), differing in the details of coloration and structure of the male hypopygium, as the short, slightly separated rostral spines and the less strongly curved dorsal dististyle.

LIMONIA (MICRANOMIA) STAUDERITA sp. nov. Plate 1, fig. 5; Plate 2, fig. 29

Belongs to *maria* group, allied to *aurita*, large (wing, male, over 8 millimeters). Halteres with base of stem yellow, remainder black, fore femora extensively blackened, bases narrowly yellow, middle and hind femora yellow basally passing through brown to brownish black; wings with a strong brownish tinge, stigma darker; abdomen black, caudal borders of segments, especially of tergites pale, basal sternites on subterminal portion extensively yellow, male hypopygium with tergal arms slender, notch between them about as wide as deep; aedeagus dilated beyond midlength.

*Male*.—Length, about 7.5 to 8 millimeters; wing, 8.5 to 9

Rostrum and palpi black. Antennae black; flagellar segments oval, constricted at measures, with conspicuous verticils; terminal segment elongate. Head with front and broad anterior vertex silvery white; posterior sclerites of head dull black.

Pronotum grayish black. Mesonotum polished black, median region of scutum, central portion of scutellum, and cephalic end of mediotergite with a yellowish gray pollen. Pleura black, sparsely gray-pruinose. Halteres relatively long, basal half or more of stem yellow, remainder black. Legs with fore coxae blackened basally, apex narrowly yellow, middle and posterior coxae uniformly yellow, trochanters yellow; fore femora extensively blackened, bases narrowly yellow, middle and hind femora yellow basally, passing into brown, tips more brownish black; tibiae brown; tarsi black. Wings (Plate 1, fig. 6) with a strong brown tinge, oval stigma darker brown, cord and outer end of cell 1st  $M_2$  very narrowly and vaguely scamed with darker; prearcular field more yellowish, veins dark, yellow in prearcular field. Venation:  $Sc_1$  long, end  $nx$  opposite or just beyond origin of  $Rs$ ,  $m-cu$  just before fork of  $M$ .

Abdomen black, caudal borders of more basal tergites narrowly pale; basal sternites with subterminal portion conspicuously yellow, caudal borders narrowly grayish. Hypopygium black. Male hypopygium (Plate 2, fig. 29) with tergal arms 9: stouter than in *aurita*, notch narrower, about as wide as deep. Basistyle,  $b$  with ventromesal lobe shorter than in *aurita*, stem stouter, pendant distal portion shorter than either the stem or the thickness at the bend. Dorsal dististyle,  $dd$ , with apex expanded, bispinous. Spine of ventral dististyle,  $rd$ , conspicuous but pale, from a low basal tubercle, apex of prolongation narrow. Gonapophysis,  $g$ , with mesal-apical lobes relatively



short, nearly straight. *Aedeagus*,  $\alpha$ , narrower than in either *aurita* or *pseudomaria*, dilated beyond midlength sides setiferous.

*Habitat*.—Northern Korea.

Holotype male, Ompo, May 28, 1937 (Yankovsky). Paratype, male, June 12, 1937.

The nearest ally is *Limonia* (*Dicranomyia*) *aurita* Alexander, of Formosa, which differs especially in the details of structure of the male hypopygium, as described above. The fly is more or less intermediate between *aurita* and *L. (D.) pseudomaria* (Alexander), of Japan, yet evidently distinct from either in the genitalic details.

*LIMONIA (DICRANOMYIA) GEFUENSIS* (Alexander)

*Dicranomyia (Dicranomyia) gefuensis* ALEXANDER, Ann. Ent. Soc. America 14 (1921) 114, 115.

Known hitherto from the Japanese Islands. Northern Korea, Ompo, altitude 160 feet, June 3 to 12, 1937; Seon Mountains, altitude 3,000 to 3,500 feet, October 9, 1937 (Yankovsky).

*LIMONIA (DICRANOMYIA) SEAYOCHETIA* sp. nov.

Allied to *stocetta*; general coloration of mesothorax dark gray, humeral and sublateral portions of praescutum obscure yellow, median area of scutum, scutellum, and a central triangle on mediotergite paler gray, thoracic pleura chiefly pale yellow; femora yellow, tips of posterior femora brownish black, remaining femora less distinctly darkened; wings brownish yellow, heavily patterned with brown; dark spots at ends of veins  $R_2$  and  $R_4$ , interconnected by dark marginal seams; abdominal tergites dark brown sternites yellow.

*Female*.—Length, excluding rostrum about 10 millimeters; wing, 9.8; rostrum alone, about 3.

Rostrum black, relatively long, stout at base, palpi black. Antennae black, first flagellar segment a trifle paler; flagellar segments oval, outer ones a little more elongate. Head dark brownish gray; anterior vertex narrow.

Pronotum dark brownish gray, lined sublaterally with paler. Mesonotal praescutum with disc dark gray, humeral and sublateral portions posteriorly broadly obscure yellow; a capillary black median vitta on anterior portion of sclerite; scutal lobes dark gray, lateral portions restrictedly paler, mesal edge of each lobe narrowly blackened; median area of scutum, scutellum and a central triangle on mediotergite paler gray, lateral borders

of mediotergite darker. Pleura chiefly obscure yellow, pleurotergite darker. Halteres pale yellow, knobs weakly darkened. Legs with coxae and trochanters pale yellow; femora yellow, tips of posterior pair conspicuously brownish black, of remaining femora less distinctly darkened, tibiae and tarsi brownish yellow. Outer tarsal segments blackened. Wings brownish yellow, prearcular region and costal border, especially cell Sc, light yellow, a heavy brown pattern, largest areas costal in distribution, first at areolas, third at origin of  $R_s$ , fourth at fork Sc, the two latter separated by a distance a little narrower than diameter of either, stigmal area large, produced behind into cell  $R_1$ , areas at ends of veins  $R_2$  and  $R_{4+5}$  interconnected by a dark marginal seam in cells  $R_2$  and  $R_3$ ; narrow brown seams along cord and outer end of cell 1st  $M_2$ ; a small oval spot at end of vein 2d A, vein 1st A unmarked or virtually so, veins yellow, darker in clouded areas. Venation: Sc long, Sc<sub>1</sub> ending nearly opposite in length of  $R_s$ , in-cu shortly before fork of M.

Abdominal tergites dark brown, caudal borders of segments narrowly paler, sternites yellow; subterminal segments more uniformly darkened.

*Habitat*.—Northern Korea.

*Holotype*, female, Ompo, altitude 170 feet, June 8, 1937 (Yanovsky).

Closest to *Limoneta* (*Geranomyia*) *avocetta* (Alexander) of Japan, differing as follows. Mesonotum dark gray, scutum, scutellum, and central area of mediotergite conspicuously pale; femoral tips darkened.

*DIKLANOPTYCHA PROLONGATA* sp. nov. Plate 1, fig. 7; Plate 2, fig. 20.

General coloration brown, antennae with basal two segments obscure yellow, flagellum dark brown, halteres pale yellow; femora yellow, tips narrowly blackened, the amount subequal on all legs; wings with a brown tinge, cell Sc clearer yellow, no dark cubital seam,  $R_s$  subequal in length to cell 1st  $M_2$ ,  $R_4$  almost in longitudinal alignment with  $R_{4+5}$ ; abdominal tergites dark brown, proximal segments paler medially, subterminal segments black, hypopygium yellow; male hypopygium with outer costistyle relatively narrow, apex long-produced; lateral terga, tibiae pale, nearly parallel-sided, tips obtuse.

*Male*.—Length, about 8.5 to 9 millimeters; wing, 9 to 9.5.

*Female*.—Length, about 8.5 to 9 millimeters; wing, 9.5 to 10.

Rostrum and palpi black. Antennae with scape and pedicel obscure yellow, flagellum dark brown; flagellar segments elong-

gate-oval, with conspicuous verticils. Head brownish gray, opaque.

Pronotum opaque brown. Mesonotum brown, humeral region of praescutum a little more reddish brown. Scutellum slightly more testaceous; postnotum more pruinose. Pleura brown, sparsely pruinose, ventra anepisternum and meron, with ventral sternopleurite, darker, forming incomplete stripes. Halteres pale yellow. Legs with coxae and trochanters yellow, femora yellow, tibiae narrowly but conspicuously blackened, the amount subequal on all legs, tibiae yellow, extreme bases and tips blackened; basitarsi yellow, outer segments infuscated. Wings (Plate 1, fig. 1) with a brown tinge, cell Sc clearer yellow, very vaguely indicated darker seams at origin of  $R_s$  along cord, and at outer end of cell 1st  $M_2$ , no dark cubital seam as in *leucosa*. veins brown, Sc yellow. Venation: Sc, opposite r-m.  $R_s$  moderately long, subequal in length to cell 1st  $M_2$ . Basal section of  $R_1$  long, almost in alignment with  $R_s$ , m-cu variable in position, from about one-fourth to midlength of cell 1st  $M_2$ .

Abdominal tergites dark brown, proximal segments with basal portions more brightened, in cases segments almost uniformly pale with lateral borders darkened; subterminal segments uniformly black; hypopygium yellow. Male hypopygium (Plate 2, fig. 30) with outer dististyle, *od*, relatively narrow, apex produced into a long, gently curved, black spine; before apex with numerous erect spinules and scabrous points the former on ventral surface. Inner dististyle, *id* with apex narrowed. Lateral tergal arms, *9r*, gently curved, nearly parallel-sided, tips a trifle widened, obtuse.

*Habitat*.—Northern Korea

Holotype, male, Ompo, altitude 800 feet, September 12, 1937 (Yankovsky). Allotopotype, female. Paratopotypes, males and females, altitude 800 to 1,750 feet, September 13 to October 27, 1937 (Yankovsky). Paratypes, males and females, Seren Mountains, altitude 2,000 to 3,000 feet October 10 to 15, 1937 (Yankovsky).

The nearest regional ally is *Diorana tucka venosa* Alexander, which differs essentially in the coloration of the body, legs and wings, and in the distinct structure of the male hypopygium. A few specimens of the type series show abnormalities of venation. One paratype has an adventitious crossvein in cell  $R_2$  of both wings almost immediately beneath  $R_3$ . A second paratype, on one wing only, has a short spur on costal section of

vein  $R_{4+5}$  at near four-fifths the length, jutting cephalad into cell  $M_2$ .

*DICRANOPTERYMA DIACANTHA* sp. nov. Plate 1, fig. 9 Plate 2, fig. 31.

General coloration black, sparsely pruinose, halteres pale yellow throughout, legs black, femora very restrictedly paler at bases; wings with a weak brown tinge;  $R_s$  considerably longer than cell 1st  $M_2$ ; branches of  $R_s$  lying parallel to one another for virtually their entire length; abdomen (male) almost uniformly light yellow, with a dark-brown or brownish-black subterminal ring; hypopygium brown; outer dististyle small, outer margin smooth, gonapophyses conspicuously bispinous.

*Male*.—Length, about 10 millimeters, wing, 11 to 11.5.

*Female*.—Length, about 12 millimeters, wing, 11.5.

Rostrum and palpi brownish black. Antennae brownish black, pedicel a trifle paler. Head light gray, anterior vertex wide, about twice diameter of scape.

Thorax black, sparsely pruinose, praescutum with three more or less distinct darker and more nitidous stripes that are more or less confluent to cover the disc behind, posterior sclerites of notum more heavily pruinose, especially in female. Picura black, pruinose. Halteres pale yellow throughout. Legs with coxae yellow, fore pair slightly darker, remainder of legs black, femoral bases very restrictedly paler, tibiae a little more brownish black. Wings (Plate 1, fig. 8) with a weak brown tinge, prearcular field and costal border a trifle more yellowish, not conspicuously so as in *stygipes*, veins dark brown. Venation.  $R_s$  considerably longer than cell 1st  $M_2$ , branches of  $R_s$  parallel to one another for virtually their whole length, rather strongly deflected caudad at their outer ends;  $m-cu$  shortly before mid-length of cell 1st  $M_2$ .

Abdomen of male almost uniformly light yellow, subterminal segments dark brown or brownish black, hypopygium brown. In the female the abdomen is more uniformly darkened. Male hypopygium (Plate 2, fig. 31) with lateral tergal arms, 91, slender, erect, nearly parallel-sided their tips obtuse. Outer dististyle, *od*, small, much shorter than inner, curved to a long black apical point, outer margin smooth inner margin before spine with small scabrous points. Aedeagus, *a*, long. Gonapophysis, *g*, produced into two long conspicuous spines.

*Habitat*.—Northern Korea.

Holotype, male, Seren Mountains, altitude 5,000 to 6,000 feet, October 3 1937 (Yankovskiy). Allotopotype, female. Parrieo-

otype, 1 male, paratype, 1 male, Chonsan, Paektusan, altitude 3700 feet, July 22, 1937 (Yankovsky).

The closest relative of the present fly is *Dicranoptycha stygipes* Alexander, of Japan, which has somewhat similarly blackened legs, differing especially in the coloration of the body and wings and in the details of venation as the short fly. The male sex of *stygipes* is unknown to me.

*ANTOCNA (ANTOCNA) BIFIDA* Alexander.

*Antocna (Antocna) bifida* ALEXANDER, Philip. Journ. Sci. 24 (1924) 554-555.

One male, from Ompo, northern Korea, altitude 900 feet, October 28, 1937, collected by Yankovsky, has coll. M<sub>2</sub> open by the atrophy of m. The structure of the male hypopygium does not appear to differ significantly from the type material.

*MELIUS CHELIUS POLIONOTA* sp. nov. Plate 1, fig. 2.

General coloration gray, praescutum with three brown stripes; rostrum longer than remainder of head, antennae with scape and pedicel black, flagellum obscure yellow, halteres pale yellow; femora yellow, tips abruptly and conspicuously black; wings whitish subhyaline, tip broadly but inconspicuously darkened; stigma oval, dark brown; prearcular field and costal border very pale yellow; m cu less than 1 s cu, length beyond fork of M.

*Female*.—Length, including rostrum, 7.5 to 8.5 millimeters, wings, 8.5 to 9, rostrum alone, 1.

Rostrum longer than remainder of head, black; palp, black. Antennae with scape and pedicel black, flagellum obscure yellow, outer segments a little darker. Head gray, with a very narrow and poorly indicated darker median line on center of vertex; anterior vertex narrow, a little more than diameter of scape, head prolonged behind.

Pronotum gray. Mesonotum gray, praescutum with three brown stripes, median stripe broader and darker, not reaching suture behind; scutellum posteriorly a trifle more reddish brown. Pleura, including dorsopleural membrane, dark brown. Halteres uniformly pale yellow. Legs with coxae yellow, fore and middle pair somewhat more infuscated basally, trochanters yellow; tips abruptly and conspicuously black, the amount subequal on all legs, tibiae obscure yellow, tips very narrowly blackened; basitarsi yellow basally, passing into black; remaining tarsal segments black. Wings (Plate 1, fig. 9) whitish

subhyaline, tip broadly but inconspicuously darkened, prearcular field and costal border very pale yellow; stigma oval, dark brown; veins dark brown, paler in yellow areas. Venation:  $Sc_1$  ending about opposite fork of  $R_s$ ,  $Sc_2$  at its tip, cell 1st  $M_2$  long, a little wider at basal end, subequal in length to vein  $M_1$  beyond it;  $m-cu$  less than its own length beyond fork of  $M_1$ .

Abdomen dark brown, very sparsely gray pruinose, valves of ovipositor elongate, horn-colored.

*Habitat*.—Northern Korea.

Holotype, female, Chonsani, Paktusan, altitude 3,000 feet, July 18, 1937 (Yankovsky). Paratopotypes, 5 females, altitude 3,000 to 3,500 feet, July 18 to 20, 1937 (Yankovsky).

*Helius (Helius) polionota* is entirely distinct from the other regional species of the genus, the gray coloration of the thorax, the pale antennal flagellum and the distinctive pattern of the legs and wings.

**HELIVS (HELIVS) GRACILLINUS** sp. nov. Plate 1, Sc. 10; Plate 2, Sc. 12.

General coloration of mesonotum obscure yellow, prescutum with faint indications of darker stripes; posterior scerites of notum darkened, pleura and pleurotergite yellow; rostrum dark, a little longer than remainder of head, halteres yellow, knobs infuscated; legs obscure yellow, tips of femora and tibiae narrowly dark brown, wings grayish subhyaline, prearcular and costal portions a little more yellowish; a restricted brown pattern, including seams at origin of  $R_s$  and along cord;  $m-cu$  shortly beyond fork of  $M_1$ ; abdominal tergites dark brown, lateral margins yellow; basal sternites more uniformly yellow; male hypopygium with basistyles slender, on mesal face near base with a stout setiferous lobe; outer dististyle an unusually slender blackened rod, apex simple and obtuse.

*Male*.—Length including rostrum, about 7 millimeters; wing, 8; antennae, about 8.

*Female*.—Length, including rostrum, about 9.5 to 11 millimeters; wing, 9 to 10.

Rostrum slightly longer than remainder of head, dark brownish gray; palpi black. Antennae black, pedicel a trifle brightened; flagellum elongate, especially in male, as shown by measurements; flagellar segments long cylindrical with a dense erect pale pubescence and scanty, slightly longer verticils; terminal segment short approximately one-third to one-fourth penultimate. Head dark gray; anterior vertex narrow.

Pronotum obscure yellow. Mesonotal praescutum obscure yellow, with faint indications of darker stripes, especially behind; scutal lobes conspicuously blackened; posterior sclerites of notum blackened, posterior margin of scutellum narrowly more reddish. Pleura and pleurotergite yellow. Halteres yellow, knobs infuscated. Legs with coxae and trochanters yellow; femora obscure yellow, tips rather narrowly dark brown; tibiae obscure yellow, tips narrowly dark brown, tarsi passing into dark brown. Wings (Plate 1, fig. 10) grayish subhyaline in male, somewhat more cream-yellow in female, prearcular and costal regions more yellowish; a restricted brown pattern, including stigma and a confluent seam on cord, together with a smaller cloud at origin of  $R_s$ , veins dark brown, pale yellow in luteous areas. Venation,  $R_s$  weakly angulated and, in cases, short-spurred at origin, branches of  $R_s$  weakly divergent outwardly;  $co_1$  1st  $M_2$  rectangular,  $m-cu$  shortly beyond fork of  $M$ .

Abdominal tergites dark brown, paler yellow laterally, especially conspicuous on outer segments, basal sternites more yellow; ninth segment darkened, style obscure yellow. Male hypopygium (Plate 2, fig. 32) with basistyle,  $b$ , unusually long and slender, on mesal face near base with a stout setiferous lobe. Outer dististyle,  $od$ , an unusually slender blackened rod, very gently curved to simple obtuse tip. Inner dististyle,  $id$ , longer, tip narrow, gently curved; outer or dorsal portion of style without setae. Interbases appearing as flattened paddlelike blades, outer margins thickened and darkened.

*Habitat*.—Northern Korea.

Holotype, male, Seren Mountains, altitude 3,000 to 3,500 feet, October 9, 1937 (Yankovsky). Allotopotype, female, altitude 1,800 feet, October 13, 1937. Paratopotypes, 3 males, several females, altitude 1,800 to 3,500 feet October 3 to 16, 1937; paratypes, 5 females, altitude 1,800 feet, October 27, 1937 (Yankovsky).

*Helius* (*Helius*) *gracilinus* somewhat resembles *H.* (*H.*) *obliteratus* Alexander and *H.* (*H.*) *subfasciatus* Alexander in the general appearance and elongate antennae in the male sex, but is entirely distinct in the structure of the male hypopygium.

#### PEDICINI

*PEDICIA* (*PEDICIA*) *LETABULIS* sp. nov. Plate 1, fig. 11; Plate 2, fig. 33.

General coloration gray, praescutum with more darker gray stripes that are narrowly bordered by blackish; scutellum yellow, halteres pale yellow, femora brownish yellow, tips not or

scarcely darkened; wings grayish, patterned with brown, markings paler in male than in female; abdomen orange, basal five tergites with three grayish black stripes, outer segments uniformly darkened; basal sternites uniformly light yellow, male hypopygium with outer angle of dististyle terminating in a long black spine from a conspicuous basal tubercle, caudal border of style with a single strong black spine.

*Male*. Length 25 to 27 millimeters, wing, 22 to 23.

*Female*.—Length 33 to 35 millimeters, wing, 26 to 27.

Rostrum dark gray, palpi black. Antennæ black, pedicel more reddish, basal segments short and crowded, outer two or three slender and elongate. Head dark gray, vertical tubercle conspicuous, apex truncated and circular in outline, appearing like a scar with slightly raised margins.

Pronotum brownish black, pruinose, posterior border more yellowish. Mesonotal praescutum with humeral region dark brown, disc almost covered by four gray stripes that are narrowly bordered by blackish; posterior sclerites of notum black, sparsely pruinose; scutellum yellow, weakly darkened medially. Pleura dark gray; dorsopleural membrane buffy. Halteres pale yellow. Legs with coxæ gray; trochanters yellow; femora brownish yellow, bases brighter, tips not or scarcely darkened; tibiae light brown, tips darker brown; tarsi passing into brownish black. Wings (Plate 1, fig. 11) grayish, central portion of disc, including cell  $R_4$  to apex, more yellowish subhyaline; a pale-brown pattern in male, much darker brown in female; cells C and Sc yellow, dark pattern extensive, including major areas in bases of cells R and M and at origin of  $R_4$ , these nearly confluent with one another the latter not quite reaching vein M behind; stem at cord broad, that along vein Cu narrow, in cases more or less obsolete along distal section of Cu but attaining margin, veins brown more yellow in costal field. Venation. Cord oblique, r-m at or beyond fork of  $R_4$ , cell 1st  $M_2$  long.

Abdomen with ground color orange, basal five tergites with three grayish black stripes, lateral pair very narrow, all stripes narrowly interrupted by reddish borders to tergites; sternites uniformly light yellow, outer segments dark brown, more or less pruinose. In female the pattern heavy, median dark tergal stripe distinct, bordered sublaterally by subous areas, lateral borders of segments broadly light gray widened behind; sternites dark brownish gray, narrowly bordered posteriorly by pale. Male hypopygium (Plate 2, fig. 38) with dististyle, d.



having outer angle terminating in a long black spine from a conspicuous basal tubercle; inner angle produced, apex truncated, caudal border of style between these angles with a single strong black spine, more or less cultriform in outline; mesal margin of style with a series of black spines, toward base slender and passing into setae.

*Habitat*.—Northern Korea.

HOLOTYPE, male, Ompo, altitude 160 feet, May 20, 1937 (Yakovlevsky). ALLOTYPE, female, Seishin, altitude 70 feet, May 13, 1937. PARATOPOTYPES, males, May 20 to 21, 1937; paratypes, 5 males, 1 female, with the allotype, May 13 to 18, 1937 (Yakovlevsky).

*Pedicia* (*Pedicia*) *infabilis* is readily told from other large regional species by the pale wing pattern of the male, the brightened color of the abdomen, and the structure of the male hypopygium.

*PEDICIA* (*PEDICIA*) *SINUATA* sp. nov. Plate I, fig. 12; Plate I, fig. 14.

General coloration gray, praescutum with four more brownish gray stripes; antennae uniformly blackened, flagellar segments short and crowded; halteres pale yellow; femora yellow, tips broadly blackened; tibiae brownish black, tarsi black; wings brownish yellow, patterned with darker brown, the two colors not conspicuously contrasting; abdominal tergites gray with two dusky longitudinal lines, interrupted by broad pale posterior borders of segments; male hypopygium with outer angle produced into a strong spine, apex blackened and acute.

*Male*.—Length, about 16 to 19 millimeters; wing, 15 to 17.

Rostrum grayish pruinose; palpi black. Antennae black, basal segments pruinose; flagellum very short, normal number of antennal segments apparently 14 but the number apparently variable, basal segments short, crowded. Head gray, with indications of a dusky capillary median vitta, vertical tubercle low.

Pronotum gray, variegated with brown. Mesonotal praescutum light gray, with four more brownish gray stripes, interspaces with conspicuous yellow setae, posterior sclerites of notum gray, scutal lobes scarcely darkened. Pleura gray; dorso-pleural membrane brownish ochraceous. Halteres pale yellow. Legs with coxae gray, trochanters brownish gray; femora yellow, tips broadly blackened, the amount subequal on all legs and including distal fourth or fifth, in some specimens fore femora more extensively blackened, involving distal third or more, tibiae brownish black, tarsi black. Wings (Plate I, fig. 12) with

ground color brownish yellow, patterned with darker brown, colors not conspicuously contrasting as is usual in the subgenus; costal and cubital darkenings and a transverse band on cord present, basal third of cells C and Sc more yellowish, basal third of cells R and M extensively darkened more or less confluent with a broad seam at origin of Rs; a darkened cloud at outer end of cell 1st  $M_2$ , veins brown, Sc yellow. Venation: Cord subtransverse to weakly oblique; Rs angulated to spurred at origin; m-cu close to or beyond fork of M. In one paratype cell  $M_2$  of both wings open by atrophy of m.

Abdominal tergites gray, with two dusky longitudinal sub-lateral lines, broken by broad ochreous posterior borders of segments, lateral borders more narrowly pale; sternites yellowish gray; hypopygium dark gray. Male hypopygium (Plate 2, fig. 34) with basistyle, *b*, unarmed with spines but with numerous elongate setae. Dististyle, *d*, with outer angle produced into a strong spine, apex acutely pointed and blackened; inner lobes much as in *baikatica*. In the latter species the apical margin of the basistyle bears a group of several stout black spines; outer margin of dististyle scoop-shaped, obtuse at apex, not blackened or produced into a spine.

*Habitat.* Northern Korea.

Holotype, male, Chonsam, Paiktusan, altitude 4,650 feet, July 17, 1937 (Yankovsky). Paratopotypes, 4 males, altitude 3,800 to 4,650 feet, July 17 to 19, 1937 (Yankovsky).

In the nature of the wing pattern, *Pedicia* (*Pedicia*) *simulata* is surprisingly like the Siberian *P. (P.) baikatica* (Alexander), but differs conspicuously in the details of structure of the male hypopygium, especially the dististyle, which is acutely spined, as is commonly the case in the subgenus *Pedicia*. The series of small-sized members of the subgenus *Pedicia* in eastern Asia, including *baikatica*, *cubitalis* Alexander, *gandicus* Alexander, *grandior* Alexander, and *subtransversa* Alexander, show a perfect transition in characters between those formerly accepted as distinguishing *Pedicia* from *Tricyphona*. These characters in *Pedicia* include major physical size, the nature of the wing pattern, obliquity of the cord, and presence of a primary spine on the outer angle of the dististyle of the male hypopygium. All of these characters break down in the series of small-sized species listed above, and it is very evident that it will be almost impossible to differentiate *Tricyphona* from *Pedicia* except as a matter of convenience in handling the complex of included forms.

**PEDICIA (PEDICIA) SUBTRANSVERSA** Alexander

*Pedicia subtransversa* ALEXANDER, Philip Journ. Sc. 90 (1932) 146, 147

Described from the Japanese Alps, Honshu Japan

NORTHERN KOREA, Chonsan, Paikusan, altitude 5,100 feet, July 21, 1937 (Yankovsky) SEREN MOUNTAINS, altitude 2,000 to 3,000 feet, October 2 and 3, 1937 (Yankovsky) I can detect no significant differences between the type material and the present series of specimens.

**PEDICIA (TRICYPHONA) PATENS** sp. nov. Plate 1, fig. 12, Plate 2, fig. 23.

Large (wing, 15 millimeters or more), general coloration yellow, pronotum with more reddish stripes; antennae with basal segments yellow, remainder brownish black; halteres yellow; femora obscure yellow, tips weakly darkened; tibiae brown, tips darker; wings tinged with brownish yellow, costal border brown, stigma yellow, ends delimited by slightly darker clouds, r-m at or before fork of Rs; cell  $M_2$  open by atrophy of m; m-cu close to fork of M; abdomen brown, hypopygium blackened; male hypopygium with dististyle bilobed, lobes stout; interbase a strongly curved spine.

*Male*.—Length, about 14 to 16 millimeters; wing, 15 to 18.

*Female*.—Length, about 19 to 20 millimeters; wing, 17 to 18.

Rostrum brownish gray; palpi black. Antennae 16-segmented; scape and pedicel yellow, flagellum brownish black, basal two or three segments paler; flagellar segments passing through oval to long-oval; longest verticils unilaterally distributed, much longer than segments; terminal segment shorter than penultimate. Head gray; vertical tubercle subcircular in outline, darkened.

Pronotum yellow. Mesonota pronotum testaceous yellow, chiefly covered by three reddish stripes, posterior interspaces slightly pruinose; scutal lobes reddish; scutellum and postnotum testaceous. Pleura yellow. Halteres relatively long and slender, yellow. Legs with coxae and trochanters yellow; femora obscure yellow, tips weakly darkened; tibiae brown, tips darker brown, tarsi black. Wings (Plate 1, fig. 12) with a strong brownish yellow tinge, cells C and Sc darker brown; stigma yellow, both ends delimited by slightly darker color; remainder of disc virtually unmarked or with cord insensibly smeared with darker; veins brown. Venation Rs variable in length, angulated and spurred at origin, r-m at or before fork of Rs.

latter in longitudinal alignment with  $R_{4+5}$ ; cell  $M_2$  open by atrophy of  $m$ ;  $m-cu$  at or close to fork of  $M$ .

Abdomen brown, outer sternites and hypopygium blackened. Male hypopygium (Plate 3, fig. 35, with dorsal plate of tergite, 9), truncate across caudal margin, with a small U-shaped median notch, ventrad of dorsal plate a fleshy ventral plate, each side bilobed. Basistyle,  $b$ , without conspicuous lobes; interbase a strong curved spine, tip acute. Dististyle,  $d$ , bilobed, outer lobe a little longer and more heavily sclerotized than inner, both lobes stout, obliquely rounded at tips.

*Habitat*.—Northern Korea.

Holotype, male, Ompo, altitude 190 feet June 2, 1937 (Yakovsky).

Allotopotype, female. Paratopotypes, several males June 1 and 2, 1937.

*Pedicia* (*Tricnophona*) *patens* is most closely allied to the Japanese *P. (T.) confuens* (Alexander) and *P. (T.) kushimensis* (Alexander) both of which are smaller, with distinctive wing patterns, and with the male hypopygia quite distinct. All three species normally have cell  $M_2$  open by atrophy of  $m$ .

*PEDICIA (TRICNOPHONA) LONGILOBA* sp. nov. Plate 3, fig. 14; Plate 3, fig. 24.

General coloration gray, praescutum with four more blackish gray stripes; antennae 16 segmented, black throughout; halteres pale yellow; femora yellow, tips brownish black; wings yellowish subhyaline, with a restricted darker cloud on anterior cord; stigma lacking,  $r-m$  close to midlength of basal section of  $R_{4+5}$ ; cell  $M_1$  sessile, male hypopygium with interbase bearing a strong lateral spine; basistyle at apex produced into two lobes, outer one unusually long, subequal in length to style itself expanded and darkened at apex, clothed with abundant long setae, shorter lobe of basistyle densely set with short black spines; dististyle subequal in length to inner lobe of basistyle, slender, parallel-sided.

*Male*.—Length, about 9 to 10 millimeters; wing, 9.5 to 10.5

Rostrum gray; palpi black. Antennae short, 16-segmented, black throughout; flagellar segments oval; verticils about equal in length to segments. Head gray, vertexal tubercle relatively conspicuous.

Thorax gray, praescutum with four more blackish gray stripes, intermediate pair not attaining suture behind, scutal lobes with darkened centers. Pleura gray; dorsopleural membrane puffy

Halteres pale yellow. Legs with coxae yellow, slightly darkened basally, trochanters yellow, femora yellow, tibiae brownish black, the amount subequal on all legs; tibiae and basitarsi brownish yellow, tips narrowly darkened, terminal tarsal segments dark brown. Wings (Plate 1, fig. 14) yellowish subhyaline, prearcular field restrictedly bright yellow; a small, darkened cloud on anterior cord; stigma lacking, veins brown. Venation.  $R_s$  relatively long, angulated, and spurred at origin;  $r-m$  close to midlength of basal section of  $R_4+5$ ; cell  $M_1$  sessile;  $m$  beyond fork of  $M_{1+2}$ .

Abdominal tergites brown, caudal borders narrowly pale, sternites more uniformly grayish yellow or brownish yellow, ninth segment blackened, basistyles yellow. Male hypopygium (Plate 3, fig. 35) with tergal lobes, 9t, appearing as glaucous flattened ears, widely separated; surface of tergite with abundant long delicate setae. Basistyle, b, with inner lobe, i, unusually long, narrowed to a curved apical hook, at near midlength bearing a long conspicuous spine, with long delicate setae on hook beyond spine; basistyle at apex prolonged into two lobes, outer lobe very long, subequal in length to basistyle itself, expanded and darkened at tips, with abundant long setae; shorter lobe oval in outline, densely set with short black peglike spines. Dististyle, d, subequal in length to shorter lobe of basistyle, narrow, parallel-sided, apex rounded with four or five elongate setae; base of style with additional setae.

*Habitat*.—Northern Korea.

Holotype, male, Ompo, May 26, 1937 (Yankovsky). Paratypes, 5 males, May 28 to June 15, 1937 (Yankovsky).

The present fly rather closely resembles *Pedicia* (*Triclyphona*) *optabilis* (Alexander) and *P. (T.) ussuriica* Alexander, but has the male hypopygium entirely different in construction, the unusually long, clavate outer lobe of the basistyle being quite unique among the species of *Triclyphona* known to me.

**PEDICIA (TRICLYPHONA) DIAPHANIDES** *sp. nov.* Plate 1, fig. 15.

Belongs to *diaphana* group; general coloration yellowish gray, praescutum with three dark-brown stripes, median stripe narrowly split behind, antennae black, 14-segmented; femora dark brown, bases yellow, wings with a brown tinge, oval stigma darker brown;  $R_s$  angulated at origin,  $r-m$  connecting with vein  $R_5$  about its own length beyond origin.

*Female*.—Length, about 10 to 11 millimeters; wing 10 to 10.5.

Rostrum gray; palpi black. Antennae 14-segmented, black throughout; flagellar segments oval. Head dark brown, anterior vertex and orbits gray.

Pronotum brownish gray. Mesonotal praescutum yellowish gray, with three dark-brown stripes: median stripe broad, slightly divided behind; centers of scutal lobes darkened. Pleura gray; dorsopleural membrane grayish yellow. Halteres with stem yellow, knob brown. Legs with coxae gray, tips yellow; trochanters yellow; femora dark brown, bases yellow; tibiae and tarsi brownish black. Wings (Plate 1, fig. 1") with a brown tinge; stigma oval, darker brown, conspicuous against the ground; veins brown. Venation:  $R_s$  variable in length, from subequal in length to distance between  $Sc_1$  and its origin to about two-thirds this distance strongly angulated at origin, cell  $M_1$  present; cell  $M_2$  normally open by atrophy of  $m$ , in cases closed;  $m-cu$  some distance beyond fork of  $M$ .

Abdomen brown, outer segments darker.

*Habitat*.—Northern Korea.

Holotype, female. Ompo, May 23, 1937 (Yankovsky). Paratopotypes, 2 females.

*Pedicia* (*Trichopoda*) *diaphanoides* is most closely allied to *P. (T.) diaphana* (Doane) of western North America. It differs in the number and structure of the flagellar segments and in the less extensively divided median praescutal stripe. No representatives of the group have been found hitherto in the eastern Palearctic Region.

**HYPERANCAEUS GLORIOSUS (Alexander) nov.**

*Hyperancaeus gloriosus* ALEXANDER, Philip Journ. Sci. 24 (1924) 569-571.

The types are from Saghalien. One female, Chonsani, Pakhtusan, northern Korea, altitude 3,700 feet, July 14, 1937 (Yankovsky).

**DICHRANOTA (METAPHIDOLADIS) FLAVOBASE M. NUSCULA nov. sp.**

*Male*.—Length, about 6.5 millimeters, wing, 7.

Generally similar to the typical form (Japan) but smaller and differing in the following respects. Legs pale brown, outer tarsal segments darker. Wings with stigma poorly indicated, pale brown; no distinct darkened clouds along cord or vein  $Cu_1$ , wing base less conspicuously yellow. Venation:  $R_s$  longer, gently arcuated,  $R_{1+2+3}$  long, subequal to or exceeding  $R_2$ ;  $Sc$  relatively short, ending before proximal end of stigma or about opposite

one-third length of  $R_{2+3}$ ; m-cu nearly its own length beyond fork of M. Male hypopygium much as in typical *flavibasis*, differing as follows: Ninth tergite more deeply emarginate, lateral lobes thus more conspicuously, broadly rounded. Outer dististyle narrower, inner style shorter. Lateral tergal arms only gently curved to acute tips, not angularly bent at midlength.

*Habitat*.—Northern Korea.

Holotype, male, Ompo, altitude 800 feet, September 22, 1937 (Yankovsky)

DIPTERA (RAPHIDOLABIS) LUTEOLA sp. nov. Plate 1, fig. 16.

General coloration of thorax and abdomen yellow, gibbous; praescutum pale brown, antennae 13-segmented, scape and pedicel yellow, flagellum black; halteres yellow, femora brown, tibiae and basitarsi whitish, tips narrowly darkened, wings whitish subhyaline, veins beyond cord a little darker, cell  $R_2$  short to long-petiolate.

*Female*.—Length, about 5.5 to 6 millimeters; wing, 5.5 to 7.

Rostrum yellow, basal segments of palpi yellow, terminal two segments black. Antennae 13-segmented, scape and pedicel yellow, flagellum black; flagellar segments oval, with verticils of moderate length. Head brownish gray.

Mesonota, praescutum pale brown, gibbous; posterior sclerites of notum, together with the pleura, yellow. Halteres pale yellow. Legs with coxae and trochanters yellow; femora brown; tibiae and tarsi whitish, tips narrowly darkened; terminal tarsal segments more darkened. Wings (Plate 1, fig. 16) whitish subhyaline, cells beyond cord a trifle darker, best evidenced by darker veins. Venation: Cell  $R_2$  short- to long-petiolate,  $R_{2+3+4}$  variable in length, from longer to shorter than basal section of  $R_5$ ; cell  $M_1$  present; cell  $M_2$  closed; m-cu beyond one-third the length of  $M_{2+3}$ .

Abdomen yellow; tergites a little more infumate, especially medially; valves of ovipositor long and powerful.

*Habitat*.—Northern Korea.

Holotype female, Ompo, altitude 150 feet, June 7, 1937 (Yankovsky). Paratopotype, female.

*Dieranota* (*Raphidolabis*) *luteola* is readily told by the general yellow color of the thorax and abdomen. It is apparently closest to the Japanese *D. (R.) consors* (Alexander) and *D. (R.) subconsors* (Alexander), which differ in the dark coloration and details of venation.

DICRANOTA (DIPATHIDOLANES) NEOCONSORIS sp. nov. Plate 1, fig. 17; Plate 3  
fig. 21.

Allied to *consors*, general coloration of mesonotum grayish testaceous, praescutum with three conspicuous dark-brown to brownish black stripes, antennae 12-segmented, halteres pale knobs weakly darkened; legs pale brown; wings grayish subhyaline, stigma very slightly darker,  $R_2$  transverse;  $R_{2+3+4}$  relatively short, male hypopygium with lateral tergal arms appearing as elongate-oval blades, basistyle with a group of strong setae on mesal face near base; interbase a strongly flattened blade, ventral margin serrulate, apex produced into a strong spine.

*Male*.—Length, about 4.5 millimeters, wing, 5.2.

*Female*.—Length, about 5.0 millimeters; wing, 6.5.

Rostrum testaceous-yellow; basal segments of palpi pale, terminal segments dark brown. Antennae 12-segmented; scape pale, remaining segments dark brown; terminal segment longer than penultimate. Head dark brown.

Mesonotum grayish testaceous, the highly convex praescutum with three conspicuous dark-brown stripes, median stripe even more blackened, lateral borders of praescutum paling to yellow; scutal lobes more diffusely darkened, scutellum and mediotergite weakly darkened. Pleura obscure yellow, ventral sternopleurite and ventral pleurotergite more darkened. Halteres pale, knobs weakly darkened. Legs with coxae brownish yellow; trochanters yellow, remainder of legs pale brown, outer tarsal segments darker. Wings (Plate 1, fig. 17) grayish subhyaline, stigma very slightly darker; veins brown. Venation  $R_2$  transverse;  $R_{2+3+4}$  relatively short, subequal to  $r-m$ .

Abdomen dark brown. Male hypopygium (Plate 3 fig. 37) with median lobe of tergite, 9t, broad, margin truncate with numerous strong setae; lateral tergal arms appearing as flattened, elongate-oval blades, on edge appearing near Basistyle b, with a group of strong setae on mesal face near base, as in *consors*; apex of basistyle without spinous points excepting a very few at inner apical angle. Interbase, l, a strongly flattened blade that terminates in a long straight acute spine latero- or ventral edge with a series of microscopic serrulations.

*Habitat*. Northern Korea.

Holotype, male, Seren Mountains, altitude 5,200 feet, October 10, 1937 (Yankovskiy). Allotype, female, Ompa, altitude 650 feet, August 11, 1937 (Yankovskiy).



The nearest ally of the present fly is *D. crassota* (*Rhaphidolabis*) *consors* Alexander, of Japan, which differs in the details of coloration and, especially, in the structure of the male hypopygium, notably the interbases.

#### HEXATOMINI

*LEMNOPHILA* (*PHILIBORIA*); *MECAPTIA* *sp. nov.* Plate 1, fig. 12, Plate 2, fig. 20.

General coloration of mesothorax yellow, unmarked, antennae (male) elongate, if bent backward extending about to third abdominal segment, basal three segments obscure yellow, remaining segments black, incisures of the more basal segments paler; femora yellow, tips narrowly blackened, the amount subequal on all legs; wings brownish yellow, prearcular and costal fields clearer yellow; a restricted brown pattern; Rs relatively long, square and spurred at origin; abdomen yellow with a black subterminal ring; male hypopygium large, caudal margin of tergite with a small notch; outer dististyle slender, at apex bent at a right angle, its outer margin roughened, gonapophyses bearing a very slender lateral branch at near midlength.

*Male*.—Length, about 8.5 to 9.5 millimeters, wing, 7.5 to 8.5, antennae, about 3.7 to 3.8.

*Female*.—Length, about 11 millimeters; wing 10.

Rostrum testaceous-yellow; palpi black. Antennae (male) elongate, if bent backward extending about to third abdominal segment; basal three segments obscure yellow succeeding segments black, incisures of more basal segments paler, outer segments uniformly darkened; flagellar segments fusiform, with a dense erect white pubescence; verticils just before midlength of segments. Head brownish gray, posterior portions obscure yellow.

Pronotum brown. Mesothorax uniformly yellow, surface more or less nitidous. Halteres pale, knobs weakly darkened. Legs with coxae and trochanters yellow; femora yellow, tips rather narrowly but conspicuously blackened, the amount subequal on all legs; tibiae yellow, tips more narrowly blackened, tars. black, proximal portions of basitarsi extensively yellow. Wings (Plate 1, fig. 12) with a strong brownish yellow tinge, prearcular and costal fields clearer yellow; stigma oval, varying from pale to dark brown; restricted brown seams at origin of  $1A_1$  along cord and at outer end of cell 1st  $M_2$ , wing tip in outer radial field more weakly darkened; a central dusky streak in cell R; veins brown, luteous in yellow areas. Venation: Rs relatively long, square, and spurred at origin,  $R_{2+3}$  in direct longitudinal

alignment with  $R_s$ , cell  $R_3$  narrowed at proximal end;  $m-cu$  at midlength of cell 1st  $M$ ; vein 2d  $A$  sinuous.

Abdomen polished yellow to rusty yellow, incisures, especially laterally on the more basal segments, blackened, the color more or less interrupted at the midline; subterminal segments and base of hypopygium black, style of large hypopygium rusty. Male hypopygium (Plate 3, fig. 38) with caudal margin of tergite, 9 $t$ , with a small, very shallow median notch, margin not produced. Outer dist. style,  $od$ , slender, narrowed outwardly, at apex bent at a right angle, its outer margin roughened. Inner dist. style about two-thirds as long, narrowed to obtuse tip. Interbase,  $i$ , appearing as a fleshy lobe apex truncate, mesal edge produced into a small cultriform blade. Gonapophyses,  $g$ , appearing as long slender curved spines, at near midlength bearing a very slender lateral branch that is about one-half as long as apophysis beyond its insertion.

*Habitat*.—Northern Korea

Holotype, male, Chonsan, Paikusan, altitude 3,800 feet, July 23, 1937 (Yankovsky). Paratopotypes, 10 males, altitude 3,500 to 3,800 feet, July 15 to 23, 1937 (Yankovsky).

Among the European species the present fly is most generally similar to *Limnophila* (*Phylidorea*) *glabrata* (Meigen), differing conspicuously in the structure of the hypopygium. It is likewise allied to *L.* (*P.*) *poctica* Osten Sacken and *L.* (*P.*) *subpoctica* Alexander, yet is amply distinct. I am following Edwards in placing these species that are alien to *bicolor* (Meigen) in the subgenus *Phylidorea*.

*LIMNOPHILA (PHYLIDOREA) SUBPOCTICA MULTIDENTATA* subgen. nov.

*Male*.—Length, about 7 to 7.5 millimeters; wing, 7.5 to 8, antennæ, about 8.1 to 9.3

*Female*.—Length, about 8.5 millimeters; wing, 7.5

Differs from typical *subpoctica* Alexander, of Saghalien, as follows: Smaller. Antennal flagellum weakly bicolored, dark brown, incisures yellow, on outer segments the color more uniform, dark brown. Legs with femora yellow, tips rather narrowly blackened, the amount subequal on all legs, including about distal fourth or fifth; tibiae yellow, tips narrowly dark brown. Wings with dark seams at origin of  $R_s$  and along cord more conspicuous, wing tip narrowly but more distinctly darkened and with small darkened marginal clouds at ends of long radial veins.  $R_s$  square and short spurred at origin. Abdomen brownish yellow, outer segments uniformly blackened

except obscure yellow to brown basistyles. Male hypopygium with apical lobes of tergite much stouter than in typical form, their apices broadly obtuse. Outer dististyle with apical point elongate, about equal to one-third length of stem. Gonapophysis with lateral appendage consisting of several short blunt points instead of two simple spurs as in *subpectica*.

*Habitat*.—Northern Korea.

Holotype, male, Chonsam, Paektusan, altitude 3,800 feet, July 23, 1937 (Yoshimoto). Allotopotype, female. Paratopotypes, males and females.

I believe that this fly will be found to represent a valid species when more material of the typical form becomes available.

*LEMNOPHILA* (PHYLIMORHA) *PERNOMITA* sp. nov. Plate 1, fig. 19; Plate 2, fig. 19.

General coloration gray-pruinose, praescutum and scutum with polished black areas; antennae (male) black, relatively elongate; halteres yellow; femora yellow, tips black; wings cream-yellow, prearcular and costal regions more saturated yellow, a relatively heavy brown wing pattern;  $R_{2+3}$  short, subequal to basal section of  $R_4$ ; cell M<sub>1</sub> present; abdomen black throughout; male hypopygium with basistyle produced caudad into a long conical lobe; outer dististyle bispinous at apex, at base on outer face with a setuliferous flange.

*Male*.—Length, about 9 to 10 millimeters, wing, 9 to 10, antennae, about 3 to 4.2.

Rostrum and palpi black. Antennae (male) black throughout, relatively elongate as shown by measurements, if bent backward extending about to base of abdomen, basal flagellar segments short-oval to subglobular, ventral faces protrusant, longest verticils a little longer than segments, outer flagellar segments passing into oval, terminal segment slender. Head dull brownish gray, front and orbits clearer gray.

Pronotum brownish gray. Mesonotal praescutum with ground color heavily brownish gray-pruinose, conspicuously patterned with three polished black stripes, median stripe broad, not reaching suture behind, posterior third deeply incised, lateral stripes crossing suture onto scutal lobes; pseudosutural foveae and lateral borders of praescutum black; posterior sclerites of notum heavily brownish gray-pruinose. Pleura heavily gray-pruinose. Halteres in form of yellow. Legs with coxae black, pruinose, trochanters obscure yellow, femora yellow, tips broadly and conspicuously blackened, most extensive on fore femora where nearly distal third to half is incised, narrower on posterior

femora, tibiae light brown to yellowish brown, tips narrowly blackened; tarsi black. Wings (Plate 1 fig. 19) with ground color cream-yellow prearcular region and cells C and Sc more saturated yellow; stigma dark brown, a relatively heavy pale brown pattern, as follows: At near one-third the length of cell R adjoining vein R, origin of  $R_s$ ; cord and outer end of cell 1st  $M_2$ , forks of  $R_{2+3+4}$  and  $M_{1+2}$ ; paler brown washes in outer ends of veins M, Cu, and anal.; wing tip in outer radial field a little darkened; costal field unmarked except for a tiny spot on  $Sc_2$ ; veins yellow in ground areas, infuscated in darkened portions. Venation:  $R_s$  relatively long, strongly arcuated at origin;  $R_{2+3+4}$  short, subequal to basal section of  $R_s$ , cell  $M_1$  subequal to its petiole, m-cu at near midlength of cell 1st  $M_2$ , anterior arculus preserved.

Abdomen black throughout. Male hypopygium (Plate 3, fig. 39) with basistyle, *b*, produced into a long conical process. Outer dististyle, *od*, with a large basal flange on outer margin, surface with abundant microscopic setulae, apex of style bispinuous. Inner dististyle with apex prolonged into a slender cylindrical point. Aedeagus relatively short, slender, subtended on either side by flattened apophyses, *g*, the truncated apices of which bear three or four spinous points.

*Habitat*.—Northern Korea.

Holotype, male, Chonsan, Paektusan, altitude 3,500 feet, July 18, 1937 (Yankovsky). Paratopotypes, 5 males.

*Limnophila* (*Phylidorea*) *pernigrata* is quite distinct from other palaeartic members of the *bicolor* group, as *L. (P.) abdominalis* (Meigen), *L. (P.) bicolor* (Meigen), *L. (P.) conifera* Lackschewitz, *L. (P.) nigricollis* (Meigen), *L. (P.) prolixicornis* Lundström, and others. *L. conifera* has the basistyles of the hypopygium conically produced, somewhat as in the present fly but in all other respects is entirely distinct.

*LIMNOPHILA* (*PRIONOLABES*) *ACANTHOPHORA* sp. nov. Plate 1, fig. 23. Plate 2, fig. 40.

General coloration polished black, head and pronotum opaque; antennae 16-segmented; halteres yellow; legs black, femora bases narrowly yellow; wings brownish yellow, sparsely patterned with brown; cell  $M_2$  present. male hypopygium with caudal margin of tergite emarginate, inner dististyle simple; gonapophyses pale yellow, stern slender, head expanded, its inner angle produced into a spine, the outer end a deep cultriform blade.

*Male*.—Length, about 10 millimeters; wing, 11

Rostrum and palpi black. Antennae 16-segmented, black throughout, basal flagellar segments subglobose, outer segments more elongate; terminal segment one-half longer than penultimate. Head black, with a yellow pollinosity.

Pronotum dull brownish black. Mesonotum polished black, vestiture sparse but erect. Pleura black, sparsely pruinose, especially on ventral pleurites. Halteres pale yellow. Legs with coxae black; trochanters brownish black; femora black, bases narrowly (base, fifth or sixth) yellow; tibiae and basitarsi brownish black, tips darker; remainder of tarsi black. Wings (Plate 1, fig. 20) brownish yellow, prearcular and costal regions clear light yellow; stigma oval, dark brown; restricted brown seams along cord, outer end of cell 1st  $M_2$ , along vein Cu, and as a spot at origin of Rs; veins brown, yellow in flavous areas. Venation: Cell  $M_1$  present; m-cu beyond mid-length of cell 1st  $M_2$ .

Abdomen, including hypopygium, black. Male hypopygium (Plate 3, fig. 40) with caudal margin of tergite, 9t, with a deep U-shaped median notch. Outer dististyle *od*, with outer setiferous lobe long and conspicuous; inner lobe terminating in an outer slender spine, inner lobe flattened, vaguely toothed. Inner dististyle, *id*, simple, terminating in four or five strong spines. Aedeagus, *a*, moderately narrow, tip long produced. Gonapophysis, *g*, distinctive, pale yellow; stem very slender, head expanded, its inner angle produced into a slender spine, opposite end deep, more or less cultriform.

*Habitat*.—Northern Korea.

Holotype, male, Ompo, altitude 150 feet, May 29, 1937 (Yankovsky).

*Limnophila* (*Pionolobus*) *acanthophora* is quite distinct from the now rather numerous species of the subgenus in eastern Asia. The shape of the gonapophysis of the male hypopygium is entirely different from that in the forms hitherto described.

*LIMNOPHILA (DIDOPTERA) USSURIANA* Alexander.

*Limnophila* (*Didoptera*) *ussuriensis* ALEXANDER, Philip. Journ. Ent. 62 (1933) 142, 143.

NORTHERN KOREA, Ompo, June 9, 1937 (Yankovsky).

*LIMNOPHILA (ELAEOPHILA) SUBCAPITATA* Alexander.

*Limnophila* (*Elaeophila*) *subcapitata* ALEXANDER, Ann. Ent. Soc. America 12 (1919) 340, 341.

NORTHERN KOREA, Ompo, altitude 90 to 100 feet, June 10 to 14, 1937 (Yankovsky). Differs from the types chiefly in having the abdominal segments of certain of the specimens less evidently bicolored.

*ULOMORPHA NIGRICOLOR* Alexander *sp. nov.*

*Utomorpha nigricolor* ALEXANDER, Ann. Mag. Nat. Hist. IX 15 (1925) 75, 76.

The unique type, a male, was from Lake Ozenuma, Honshu, Japan. Northern Korea, Ompo, altitude 600 feet, June, 23, 1937 (Yankovsky); two males. These latter specimens are not entirely typical. The dark pattern of the wings is restricted to a long narrow stigma and a narrow seam along cord. Cell  $R_2$  varies from very short-petiolate to entirely sessile. The male hypopygium shows the caudal margin of the tergite produced into two well produced blackened lobes, separated by a broad U-shaped notch.

*HEMATOMA (HEMOCERA) FERNICRISA* *sp. nov.* Plate I, fig. 21.

General coloration opaque black, præscutum with four more glabrous stripes, antennæ, halteres, and legs black throughout; wings with a strong blackish tinge, costal border and stigma darker, macrotrichia of veins beyond cord sparse;  $R_{2+3+4}$  much shorter than basal section of  $R_2$ , m-cu at near midlength of cell 1st  $M_2$ .

*Male*.—Length, about 11 to 12 millimeters; wing, 10 to 11, antennæ, 3.8 to 4.

*Female*.—Length, about 17 to 18 millimeters; wing, 13 to 14.

Rostrum and palpi black. Antennæ of male 8-segmented, of female 11-segmented; black throughout, scape slightly more pruinose; flagellar segments gradually decreasing in length. Head dull black; vertical tubercle low.

Thorax dull black, præscutum with four more glabrous stripes that are not conspicuous against the ground; vestiture of thorax abundant, erect. Pleura more heavily dusted with brownish gray. Halteres and legs black throughout. Wings (Plate I, fig. 21) with a strong blackish tinge, costal border and stigma darker; veins dark, less evidently seamed with darker. Macrotrichia of veins beyond cord very sparse, with two or three on each of veins  $R_3$  and distal section of  $R_4$ . Venation:  $R_5$  long, exceeding  $R_4$  arcuated at origin;  $R_{2+3+4}$  short, a little more than one-half basal section of  $R_2$  and a little less than  $R_{1+2}$ ;

veins  $R_3$  and  $R_4$  weakly divergent at tips, m-cu at midlength of rectangular cell 1st  $M_2$  longer than distal section of vein  $Cu_1$ .

Abdomen uniformly dull black. Ovipositor with elongate valves.

*Habitat*.—Northern Korea.

*Holotype*, male, Ompo, altitude 450 feet, June 14, 1937 (Yankovsky). *Allotopotype*, female. *Paratopotypes*, several males and females.

*Hexatoma* (*Eriocera*) *pernigrina* is allied to regional species such as *H. (E.) kamigai* Alexander, *H. (E.) kariyai* Alexander, *H. (E.) longifurca* (Alexander), and *H. (E.) pleskei* Alexander, differing from all in the intensely black color of the body, antennae, halteres, and legs, and in the strongly blackened but virtually unpatterned wings.

#### ER. OPTERINI

*CONDOMYIA* (*DIPOCERA*) *PERFALLENS* sp. nov. Plate 1, fig. 22; Plate 3, fig. 41.

Allied to *pallens*; general coloration brownish yellow, segments sparsely pruinose, pleura unstriped; legs obscure yellow outer tarsal segments slightly darker; wings pale grayish yellow, unmarked;  $Sc_1$  ending about opposite midlength of  $R_s$ ;  $R_{1+2}$  and  $R_3$  close together at wing margin; male hypopygium with tergal lobes not developed, middle dististyle with outer arm unusually long and slender.

*Male*.—Length, about 5 millimeters, wing, 6.

*Female*.—Length, about 5.5 millimeters, wing, 7.

Rostrum brownish yellow, palpi black. Antennae with scape and pedicel light yellow, flagellum dark brown; flagellar segments oval to long-oval. Head brownish ochraceous.

Mesonotal praescutum pale brownish yellow, sparsely pruinose, with poorly defined darker stripes occupying interspaces behind; scutal lobes weakly darkened, posterior sclerites pale brownish yellow. Pleura pale yellow. Halteres pale, knobs weakly darkened. Legs with coxae and trochanters pale yellow; remainder of legs obscure yellow, outer tarsal segments slightly darker. Wings (Plate 1, fig. 22, pale grayish yellow, unmarked; veins a little darker than ground. Venation:  $Sc_1$  ending opposite or slightly beyond midlength of  $R_s$ ;  $R_{1+2}$  and  $R_3$  close together at wing margin, petiole of cell 2d  $M_2$  a little exceeding one-third the cell; m-cu more than its own length before fork of  $M$ .

Abdominal tergites yellowish brown; sternites and hypopygium yellow. Male hypopygium (Plate 3, fig. 41) with tergal

lobes not developed. Outer dististyle, *od*, a slender simple rod, tip blackened; middle style, *md*, with outer arm unusually long and slender; inner style, *id*, deeply bifid, outer arm acutely pointed and blackened. Aedeagus, *a*, trispinous and blackened at apex, the more basal spine much larger.

*Habitat*.—Northern Korea.

Holotype, male, Ompo, altitude 150 feet, June 7, 1937 (Yankovsky). Allotopotype, female, June 20, 1937. Paratopotype, 1 male, pinned with the holotype.

The nearest relative of the present fly is *Gonomiya* (*Idiocera*) *pallens* Alexander (Japan, Honshu) which differs in the striped thoracic pleura and structure of the male hypopygium. The conspicuous tergal development of *pallens* is not apparent in the present fly. In *pallens* these arms are very long and conspicuous, only a little shorter than the outer dististyle.

*GONOMIYA* (*GONOMIYA*) *SUPERBA* Alexander var.

*Gonomiya* (*Gonomiya*) *superba* ALEXANDER, Canad. Ent. 41 (1913) 285, 286.

Widely distributed in Japan.

NORTHERN KOREA, Chonsan, Paikusan, altitude 4,200 feet, July 24 and 25, 1937 (Yankovsky). I cannot separate these specimens specifically from the type material.

DIPTERA (TEPHRITIDAE) PACHYMERIDAE sp. nov. Plate I (fig. 23) Plate 2, fig. 42.

General coloration yellow, praescutum with four brownish stripes; antennae dark brown; ventral thoracic pleura darkened, dorsal pleura yellow, halteres and legs yellow; wings deep saturated yellow, veins pale, poorly defined against ground; male hypopygium with both dististyles slender, simple, narrowed to acute blackened points; gonapophysis bispinous, inner spine nearly straight, outer spine strongly curved.

*Male*.—Length, about 3 millimeters; wing 5.5.

Rostrum yellow; palpi black. Antennae dark brown, scape a little paler. Eyes (male) large, contiguous beneath. Head infuscated, paling to yellow behind.

Pronotum light yellow. Mesonotal praescutum obscure yellow, with four brownish stripes, intermediate pair darker in front, not reaching suture behind, lateral borders yellow; scutum with lobes extensively infuscated, median area yellow; scutellum light yellow; postnotum obscure yellow, posterior portion of both mediotergite and pleurotergite darker. Pleura with dorsal pleurites and dorsopleural membrane yellow, ventral pleurites, m-



cluding ventral anepisternum, sternopleurite, and meron more infuscated. Halteres yellow. Legs with coxae yellow, fore coxae a trifle darker; trochanters yellow, remainder of legs yellow, terminal tarsal segments darkened. Wings (Plate 1, fig. 23) deep saturated brownish yellow, veins pale yellow, very difficult to see against the ground. Venation. Vein  $M_2$  at apex deflected strongly cephalad; vein 2d A strongly sinuous.

Abdomen brownish yellow, hypopygium yellow. Male hypopygium (Plate 3, fig. 42) with basistyles,  $b$ , slender. Both dististyles slender, simple, of approximately similar outline narrowed gradually to acute blocked tips; outer style, od, glabrous; inner style with a few microscopic setae before first gonapophyses,  $g$ , appearing as flattened plates, each bearing an inner spine nearly straight the shorter outer spine strongly curved.

*Habitat*.—Northern Korea.

Holotype, male, Chon-an, Parkusan aitude 1,200 feet July 16, 1937 (Yankovsky).

*Erioptera* (*Erioptera*) *pallidivitta* is quite distinct from the other regional members of the subgenus differing especially in the body coloration, the pale wing veins, and the structure of the male hypopygium. The only other generally similar species in eastern Asia is *E. (E.) xanthoptera* Alexander, of Saghalien which differs in the details of body coloration and in the color and venation of the wings. The male of the latter species is still unknown. Among the European species the fly is closest to *E. (E.) squallida* Loew, yet is amply distinct.

**ORNOSTIA (ORNOSTIA) BUCALIS** sp. nov. Plate 1, fig. 24; Plate 3, fig. 43

Large (wing male, over 7 millimeters); general coloration black, including antennae and legs; halteres with conspicuous light yellow knobs; wings strongly tinged with blackish, cell  $M_2$  open by atrophy of  $m$ , vein 2d A nearly straight; male hypopygium with caudal border of tergite moderately produced; three dististyles, outer clavate; gonapophyses appearing as slender, straight rods, tips acute.

*Male*.—Length, about 6.5 millimeters, wing, 7.2.

Rostrum and palpi black. Antennae black throughout, of moderate length, if bent backward extending about to wing root, flagellar segments long oval to elongate, especially the outer ones; longest verticils unilaterally arranged, much exceeding segments in length, especially the more basal ones. Head dull black.

Thorax dull black, pronotum and pleura more pruinose, interspaces with abundant long erect black setae. Halleres with stem black knob conspicuously light yellow. Legs black throughout. Wings (Plate 1, fig. 24) with a strong blackish tinge, stigmal region a trifle darker, veins and macrotrichia dark. Macrotrichia of cells unusually abundant and conspicuous (indicated in figure by stippled dots). Venation:  $Sc_1$  ending nearly opposite  $R_1$ ,  $R_2$  subequal in length to  $Sc_1$ ,  $R_{3+4}$  short, slightly exceeding  $R_{5+6}$ ; cell  $M_2$  open by atrophy of  $m$ ; cells beyond cord deep; vein 2d A nearly straight to very feebly concave.

Andromen, including hypopygium, black. Male hypopygium (Plate 3, fig. 43) with caudal border of tergite 9t, moderately produced. Three dististyles or primary branches, the outer, *od*, longest, appearing as a dark clavate rod, head scabrous, intermediate style *md*, about four-fifths as long, blackened, slender, gently sinuous, acule tip strongly curved; inner style *id*, yellow, compressed, tip obtuse, near base darkened and with numerous setae. Gonapophyses, *g*, appearing as slender, glabrous, nearly straight rods, tips long and slender, acute, darkened.

*Habitat*.—Northern Korea

Holotype, male, Ompo, altitude 170 feet, May 23, 1937 (Yankovsky)

*Ormosia* (*Ormosia*) *ducalis* is very different from all other species of the genus so far discovered. The open cell  $M_2$ , with  $m$  lacking, is found also in the otherwise entirely different *O. (O.) confluenta* Alexander, of Japan.

## ILLUSTRATIONS

Legend: a. Ectepagus b. basistyle d. dististyle dd. dorsal dististyle e. coxaeapophysis:  
l. interbasal; id. outer dististyle, ind. intermediate dististyle, od. outer dististyle, p.  
phallosome c. tergite

### PLATE 1

- FIG. 1. *Protandrus yunkovskyi* sp. nov.; venation.  
2. *Trichocera tuberculifera* sp. nov.; venation.  
3. *Trichocera latilobata* sp. nov.; venation.  
4. *Limonia* (*Limonia*) *venerabilis* sp. nov.; venation.  
5. *Limonia* (*Diceranomyia*) *infensa* sp. nov.; venation.  
6. *Limonia* (*Diceranomyia*) *subaurita* sp. nov.; venation.  
7. *Diceranoplycha prolongata* sp. nov.; venation.  
8. *Diceranoplycha diacantha* sp. nov.; venation.  
9. *Helius* (*Helius*) *pachnota* sp. nov.; venation.  
10. *Helius* (*Helius*) *gracillimus* sp. nov.; venation.  
11. *Pedicia* (*Pedicia*) *latavilis* sp. nov.; venation.  
12. *Pedicia* (*Pedicia*) *simulata* sp. nov.; venation.  
13. *Pedicia* (*Tricynphora*) *patens* sp. nov.; venation.  
14. *Pedicia* (*Tricynphora*) *longiloba* sp. nov.; venation.  
15. *Pedicia* (*Tricynphora*) *daphnoides* sp. nov.; venation.  
16. *Dicranota* (*Rhaphidolabis*) *luteola* sp. nov.; venation.  
17. *Dicranota* (*Rhaphidolabis*) *neconsors* sp. nov.; venation.  
18. *Limnophila* (*Phylidorea*) *megaphysa* sp. nov.; venation.  
19. *Limnophila* (*Phylidorea*) *pernigrata* sp. nov.; venation.  
20. *Limnophila* (*Prionolabis*) *acanthophora* sp. nov.; venation.  
21. *Hexatoma* (*Eriocera*) *pernigrata* sp. nov.; venation.  
22. *Gonomyia* (*Idiocera*) *perpalpus* sp. nov.; venation.  
23. *Erioptera* (*Erioptera*) *palidiventa* sp. nov.; venation.  
24. *Ormosia* (*Ormosia*) *ducalis* sp. nov.; venation.

### PLATE 2

- FIG. 25. *Trichocera tuberculifera* sp. nov.; male hypopygium.  
26. *Trichocera latilobata* sp. nov.; male hypopygium.  
27. *Limonia* (*Limonia*) *venerabilis* sp. nov.; male hypopygium.  
28. *Limonia* (*Diceranomyia*) *infensa* sp. nov.; male hypopygium.  
29. *Limonia* (*Diceranomyia*) *subaurita* sp. nov.; male hypopygium.  
30. *Diceranoplycha prolongata* sp. nov.; male hypopygium.  
31. *Diceranoplycha diacantha* sp. nov.; male hypopygium.  
32. *Helius* (*Helius*) *gracillimus* sp. nov.; male hypopygium.  
33. *Pedicia* (*Pedicia*) *latavilis* sp. nov.; male hypopygium dististyle.  
34. *Pedicia* (*Pedicia*) *simulata* sp. nov.; male hypopygium.

## PLATE 3

- FIG 35. *Pedicia* (*Tricypone*) *petersi* sp. nov. male hypopygium.  
36. *Pedicia* (*Tricypone*) *longiloba* sp. nov., male hypopygium.  
37. *Picranola* (*Rhaphidolabis*) *neocausaria* sp. nov.; male hypopygium.  
38. *Limnephila* (*Phylidorea*) *neganygia* sp. nov., male hypopygium.  
39. *Limnephila* (*Phylidorea*) *peruviana* sp. nov., male hypopygium.  
40. *Limnephila* (*Prionolabis*) *acanthophora* sp. nov.; male hypopygium.  
41. *Conomyia* (*Idiocera*) *peruviana* sp. nov.; male hypopygium.  
42. *Etroneura* (*Etroneura*) *gallidivora* sp. nov.; male hypopygium.  
43. *Ormosia* (*Ormosia*) *ducalis* sp. nov., male hypopygium.

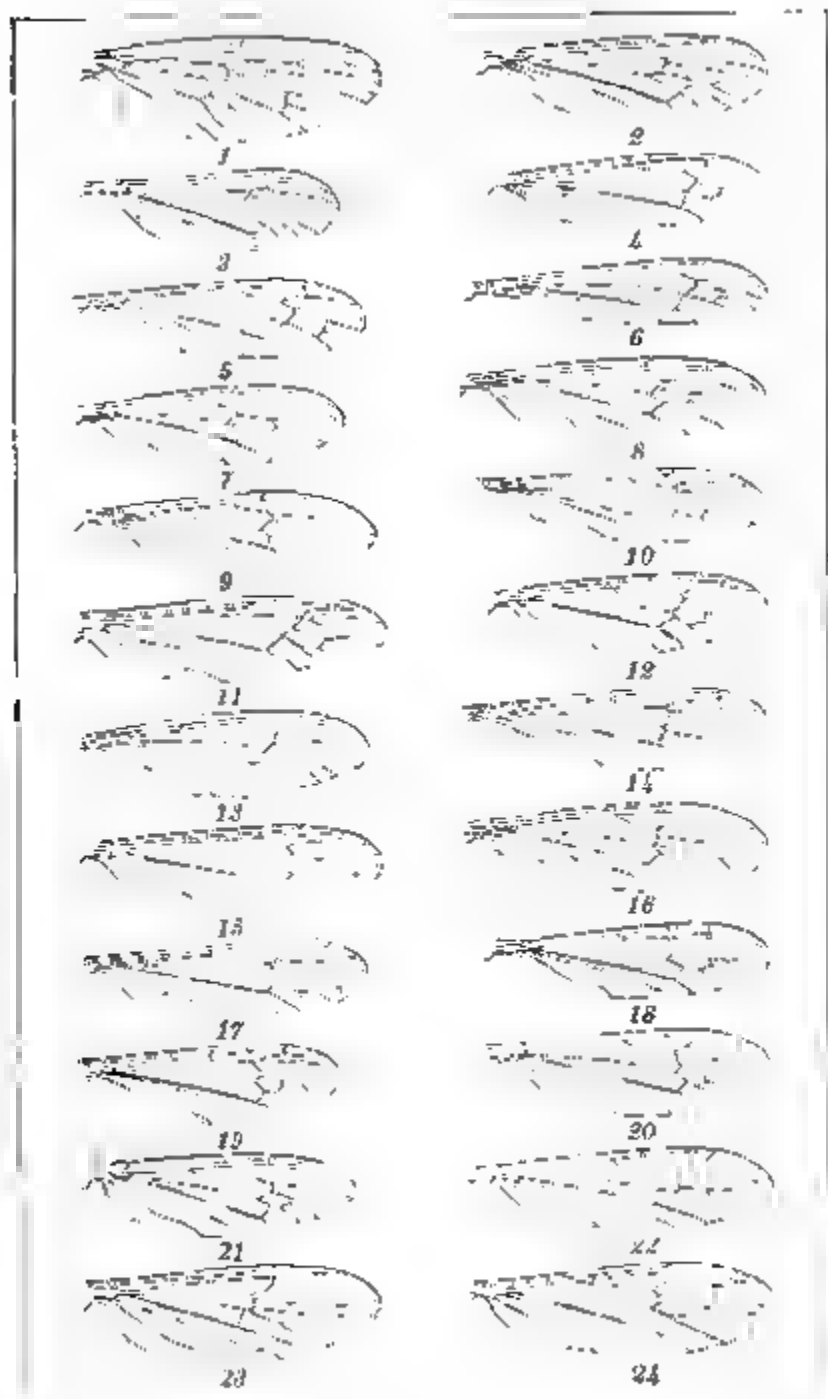


PLATE I.



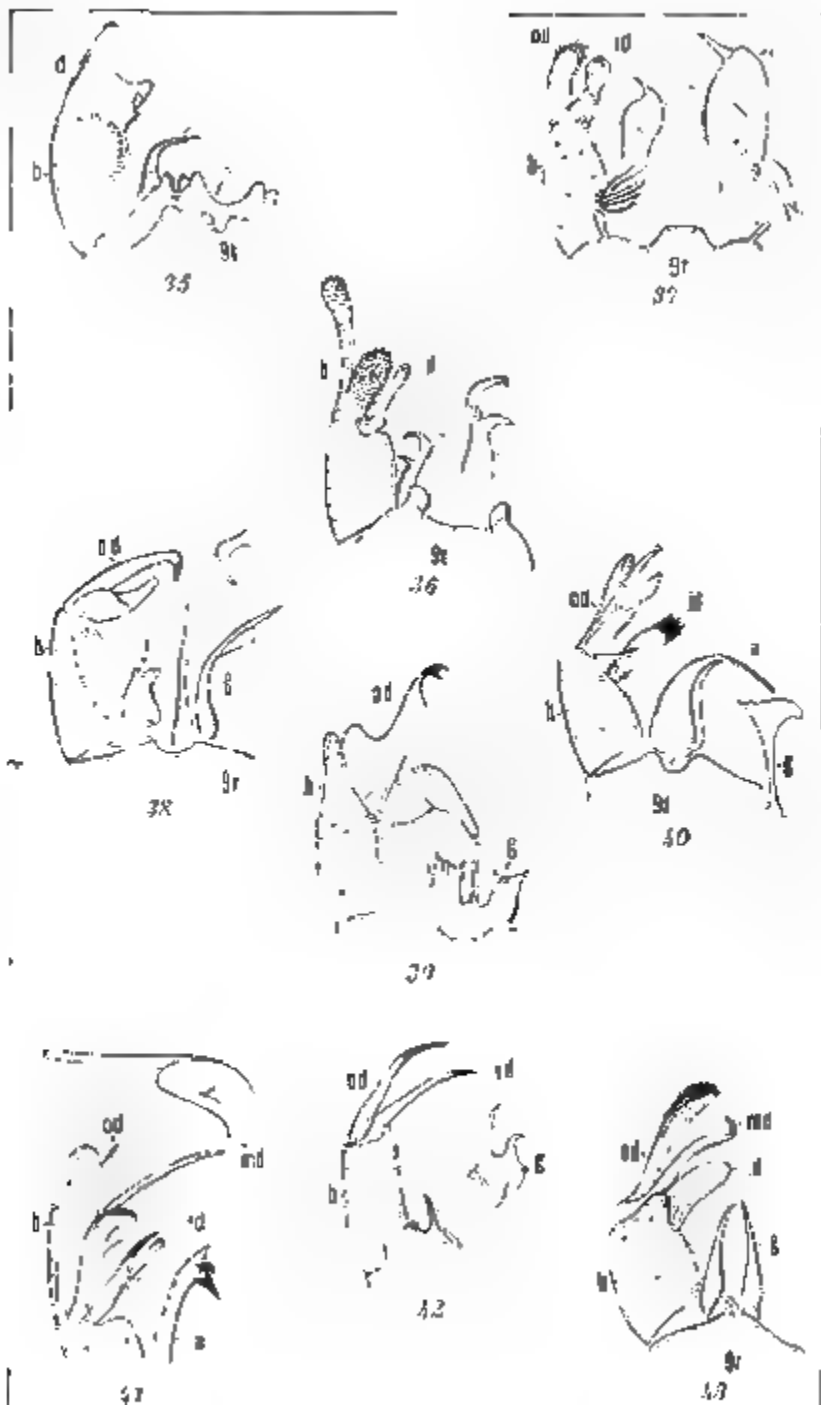


PLATE 3.

NOTES ON THE ALGAL FLORA OF NEW ZEALAND, I  
FRESH-WATER DIATOMS FROM NEW ZEALAND

By B. W. SKVORTZOV  
Of Harbin, Manchou-kuo

ONE TEXT FIGURE

In this series I am going to publish various observations I have made on the Algae of New Zealand including lists and descriptions of species in smaller collections submitted to me for investigation, essays and observations on biological matters, and other data. During the past 70 years a considerable amount of work has been done on the fresh-water algae of New Zealand, but our knowledge of their distribution throughout this area still remains very fragmentary and incomplete.

So little attention has been paid to New Zealand fresh-water diatoms hitherto, that only a few papers have as yet been published. As far as I know the first fresh-water diatom samples have been collected in New Zealand by Dr. W. Lauder Lindsay in 1861 in the Greensland district of Otago, around the station or farm of Fairfield, Saddlehill. The determinations of the collection have been made by Dr. R. K. Greville, of Edinburgh, and published by Dr. Lauder Lindsay in 1867 (6, 7). The Lauder Lindsay list contains 110 species, three of which, *Cymbella Lindsayiana* Greville, *Stauroneis scaphulaciformis* Greville, and *Stauroneis rotundata* Greville, were described and figured by R. K. Greville (4, 5). No descriptions and no figures are given in Lauder Lindsay's paper on New Zealand diatoms. As states P. T. Cleve, (2) *Cymbella Lindsayiana* Greville "is closely connected with *Cymbella Hauckii* of Van Heurck, but the description and figures given by Greville are not sufficient for identification. I could not find the two new *Stauroneis* in the P. T. Cleve monograph, but they were figured in plates 72 and 73, figs. 30, 31, and 32 of the "Diatomaceenfauna zusammengestellt für einige

\* Trans. Bot. Soc. Edinb. 8: 234, pl. 2, figs. 3-5.



Freunde.(3) These two diatoms, incompletely figured, are distinct species. *Stauroneis scaphulaeformis* Greville in its outline is very similar to *Stauroneis Playfairiana* Skvortzow, recently described as a fossil from neogene deposits in New South Wales, Australia.(10)

The next samples of fresh-water diatoms were collected in New Zealand by Dr. S. Berggren in 1874 and 1875, and distributed in microscopical slides as "Diatoms edited by P. T. Cleve and P. D. Møller" Part 2, Upsala (1898) No. 90, in which the following fossil fresh-water species from Arthur's Pass were published. *Amphora Berggrenii* Cleve, *Navicula rhomboides* Ehr. fo. *gracilis*, *Navicula Tabellaria* Ehr fo. *curta*, *Navicula seriana* Kütz. fo. *curta*, *Navicula firma* Kütz var., and *Eucyponema gracile* (Ehr.) Rabh.

In 1881 P. T. Cleve published a paper with the description of 2 new diatoms from New Zealand, *Amphora Berggrenii* Cleve, *Stephanodiscus Novae Zealandiae* Cleve, recorded from Roto Rua Lake, and *Triceratium trifoliatum* Cleve, a curious diatom remarkable for its fresh-water habit, and which seems, according to P. T. Cleve, to be most nearly related to *Hydrosera* Wallich from Ganges River in India, but which is entirely different.(1) No diatoms are listed in the paper of Dr. Otto Nordstedt on fresh-water algae of New Zealand (8) In P. T. Cleve's monograph on Naviculoid Diatoms 71 different diatoms are reported from New Zealand, with descriptions of the new species *Diplo-neta subocellis* Cleve from Paeroa, *Gomphonema Berggrenii* Cleve from Waitangi, and Roto Rua Lake, *Navicula Pusa* Cleve from Roto Rua Lake collected by S. Berggren, and *Navicula aerospaeria* Brch var *leavis* Cleve.(2) In the paper of Ternero at Peragallo "Diatomees du Monde Entier" published in 1915 several lists of fresh-water diatoms are given from fresh-water deposits of Wangarei, from Roto Teia Lake, Korowara, Waitangi, Auckland, Pakaraka. *Entonia unequalis* M. Per is reported as a new species without figure.(11) The next list of fresh-water diatoms was published by the late G. B. de Toni and Achille Forti in 1923, this material was collected by the reverend dott. Giuseppe Capra in Rotoreia Lake, Wakatereia, Ohinehom, and Port Chermers.(12) In the famous atlas "Dr. A. Schmidt Atlas Diatomaceenkunde" published by the late Dr. Fr. Fricko and now by Dr. Fr. Hustuit, from 1901 to 1914, few New Zealand diatoms were figured. Dr. Fr. Fricko's figures are of *Stephanodiscus Novae Zealandiae* Cleve, plate 225, figs. 33 to

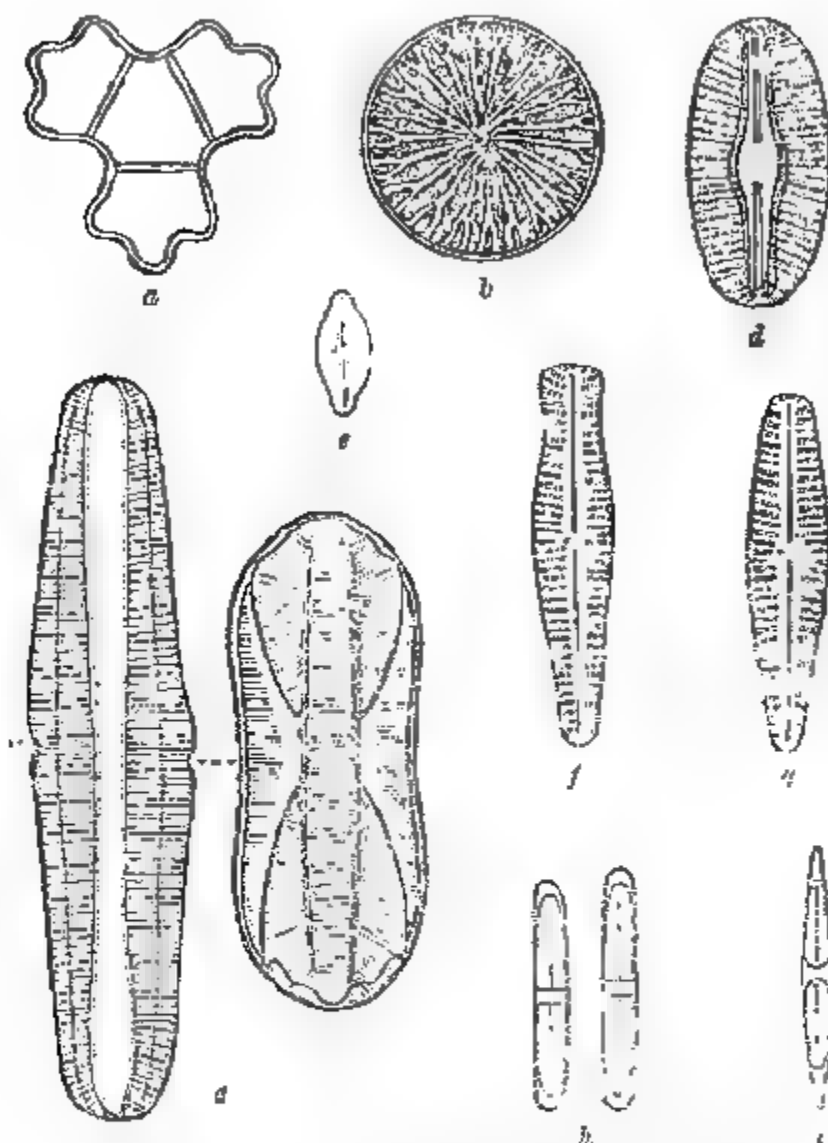


FIG. 1. a, *Tricostema trifoliatum* Cleve (after Cleve), b, *Stephanodiscus Nova Zeelandica* Cleve (after Cleve), c, *Anabaena elongata* Cleve (after Cleve), d, *Dasypleura subornata* Cleve (after Cleve), e, *Nannochloris Potts* Cleve (after Cleve), f, g, *Gomphonema Berggrenii* Cleve (after Cleve), h, *Gomphonema gracile* var. *lanceolata* Kütz. (after Grun.), i, *Gomphonema gracile* var. *lanceolata* Kütz. (after Grun.).

35, *Gomphonema Berggrenii* Cleve, plate 240, figs. 23 to 30; *Gomphonema subornatum* Grun., plate 240, figs. 31 and 32; *Gomphonema gracile* var. *lanceolata* Kütz., plate 236, figs. 25

to 28, and plate 237, fig. 10, *Gomphonema lanceolatum* Ehr., plate 236, fig. 33. In 1914 Dr. Fr. Husted published diagrams of *Eunotia erica* Ehr., plate 290, fig. 8; *Rhopodia Novae Zelandiae* Hust., plate 294, fig. 10, and *Synedra ulna* (Nitzsch) Ehr., plate 301, fig. 11, and plate 302, fig. 2.

As the papers of R. K. Greville, P. T. Cleve and others are scarce and rare I am giving an account of all fresh-water diatoms provisionally recorded from New Zealand, and several diagrams of rare species. The number after each species corresponds to the locality from which it was obtained. These localities and numbers are as follows, 1, Roto Rua Lake, 2, Korawara, 3, Waitangi, 4, Cabbage-tree swamp, Auckland, from fresh-water deposits, 5, Wanganui, from fresh-water deposits, 6 Auckland from fresh-water deposits, 7, Pakarua, from fresh-water deposits, 8, Wakavareva, 9, O. inemutu, 10, Port Chalmers, 11, Paeoa; 12, Bluff; 13, New Zealand reported by P. T. Cleve; 14, Otago, by W. S. Lindsay. I have left the original nomenclature of the authors. This nomenclature has in many places grown old, and as all diatoms have not been figured in the reports it is impossible now to correct the names.

#### DIATOMS RECORDED FROM FRESH WATERS OF NEW ZEALAND

<i>Triceratium trifoliatum</i> Cleve, 13.	<i>Cyclotella operculata</i> Kütz., 14
<i>Melosira arenulata</i> Kütz., 1, 3, 6, 7, 8.	<i>Cyclotella Kitzingiana</i> Thw 7, 14
<i>Melosira arenulata</i> var. <i>tenax</i> , 3.	<i>Cyclotella punctata</i> Sm., 14.
<i>Melosira arenulata</i> var. <i>ambigua</i> Grun., 2.	<i>Cyclotella minutula</i> 14
<i>Melosira arenulata</i> var. <i>ovata</i> Grun., 6.	<i>Hyalodiscus subtilis</i> Ba., 14.
<i>Melosira granulata</i> (Ehr.) Hust., 5, 9.	<i>Actinopteryx undulatus</i> K., 14.
<i>Melosira granulata</i> var. <i>decurcata</i> (Ehr.) Grun., 1, 9.	<i>Denticula tenuis</i> K. 14.
<i>Melosira laevis</i> Ehr., 4.	<i>Quamocladium mutabile</i> Sm. 14.
<i>Melosira Roeseana</i> Rub. var., 4.	<i>Fragilaria capricornis</i> Desm., 14
<i>Melosira Roeseana</i> var. <i>epidendrum</i> , 4.	<i>Meridion contractum</i> Hust., 3, 14.
<i>Melosira subflexilis</i> Kütz. 14	<i>Meridion circulare</i> Grev., 14
<i>Melosira ovalis</i> Hust., 14.	<i>Synedra acuta</i> Kütz., 1.
<i>Lyngbya varians</i> de Toni, 1, 3, 8, 14.	<i>Synedra ulna</i> (Nitz.) Ehr., 1, 5, 8, 9, 14.
<i>Stephanodiscus Novae Zelandiae</i> Cleve, 1, 8, D.	<i>Synedra ulna</i> var. <i>lancoolata</i> (Kütz.) Grun., 8.
<i>Cyclotella stelligera</i> Cleve et Grun., 1, 8.	<i>Synedra ulna</i> var. <i>oxyrhynchus</i> (Kütz.) Grun., 8.
	<i>Synedra ulna</i> var. <i>oxyrhynchus</i> fo. <i>medicamentata</i> Forti, 4.
	<i>Synedra ulna</i> var. <i>longissima</i> , 4
	<i>Synedra rumpens</i> Kütz., 4.
	<i>Synedra rumpens</i> var. <i>fragilaris</i> d. s. 4.

- Synedra nitida* K. 14.  
*Synedra radicans* K. 14.  
*Synedra delicatissima* Sm. 14.  
*Synedra tenera* Sm. 14.  
*Synedra acuta* Ehr. 14.  
*Synedra juncifolia* A. Ag. 14.  
*Synedra serpyllifolia* Ehr. 2.  
*Synedra poaeoides* (C. Mull.) Rabb. 2, 14.  
*Synedra everta* Kütz. 1, 9.  
*Synedra gracilis* Sm. 14.  
*Synedra impressa* Grun. 3.  
*Synedra unguiculata* M. Per. 3.  
*Synedra linearis* Grun. 3.  
*Synedra linearis* var. *alpina*, 3.  
*Synedra linearis* var. *major*, 3.  
*Synedra linearis* var. *subarctica*, 3.  
*Synedra linearis* Ehr. 1, 4, 6.  
*Synedra ophiocarpa* (Clev.) 1.  
*Synedra unguiculata* Ehr. 4.  
*Synedra major* Rabb. 2.  
*Synedra major* Ehr. 4.  
*Synedra monodactyla* (C. Ag.) 4.  
*Synedra parvifolia* Ehr. 4.  
*Synedra praevaria* var. *badua*, 4, 7, 14.  
*Synedra crux* Ehr. 4.  
*Synedra Ha. latifolia* (Grev.) 14.  
*Cocconia placidula* Ehr. 1, 3, 5, 8, 9, 14.  
*Cocconia penicillata* Ehr. 14.  
*Achnanthes ciliata* K. 14.  
*Achnanthes inflata* (Kütz.) Grun. 4, 7, 8.  
*Achnanthes Hualianum* Grun. 13.  
*Achnanthes lanceolata* (Breb.) Grun. 4, 6, 7, 8, 11.  
*Achnanthes lanceolata* var. *inflata* A. Mayer, 8.  
*Achnanthes exigua* Grun. 13.  
*Achnanthidium linearis* Sm. 14.  
*Achnanthidium coarctatum* Breb. 14.  
*Achnanthidium trunchei* Arn. 14.  
*Rhacosphenum curvata* (Kütz.) Grun. 13.  
*Frustulia rhomboides* Ehr. 1, 3, 8, 14.  
*Frustulia rhomboides* var. *lancoletata* Ehr. 13.  
*Frustulia vulgaris* Thw. 3, 8, 14.  
*Frustulia vulgaris* var. *saxonica* Rabb. 13.  
*Cyrtosigma Kütz. Grun. 13.*  
*Cyrtosigma acuminatum* (Kütz.) Rabb. 8.  
*Cyrtosigma linearis* Lagerst. 13.  
*Cyrtosigma linearis* Ehr. var. *gracilis* (Clev.) 13.  
*Cyrtosigma linearis* var. *ventricosa* (Ehr.) Donk. 4.  
*Nedra affinis* Ehr. 2, 4, 14.  
*Nedra affinis* Ehr. var. *amphicarpa* Ehr. 14. *major*, 5, 13.  
*Nedra Hualianum* Ehr. 10.  
*Nedra linearis*, 14.  
*Nedra linearis* Ehr. 1, 5, 9, 13.  
*Nedra linearis* 14.  
*Diptoma elliptica* Kütz. 1, 8, 14.  
*Diptoma subovalis* Clev. 11.  
*Stauroneis Franciscana* Grun. 2, 13.  
*Stauroneis acuta* W. Smith, 8, 13.  
*Stauroneis linearis* Rabb. 2, 13.  
*Stauroneis anceps* Ehr. 1, 3, 8, 14.  
*Stauroneis anceps* var. *gracilis* (Rabb.) Grun. 8, 14.  
*Stauroneis anceps* var. *linearis* Ehr. 14.  
*Stauroneis phocicea* Ehr. 3, 8, 14.  
*Stauroneis jamaicensis* Grun. 4.  
*Stauroneis staphyliniformis* Grev. 4, 14.  
*Stauroneis rotundata* Grev. 14.  
*Stauroneis constricta* Ehr. 14.  
*Stauroneis platystoma* Ehr. 14.  
*Pleurostaurus inflatus* (Hedl.) de Toni et Forti, 8.  
*Justoploia lanceolata* Thw. 14.  
*Colostoma neglectum* ? Thw. 14.  
*Navicula pupula* Kütz. 1, 5, 9, 13.  
*Navicula bacilliformis* Grun. 4.  
*Navicula pseudo-bacillum* Grun. 13.  
*Navicula pusio* Clev. 1.  
*Navicula vulpina* Kütz. 13.  
*Navicula salinarum* Grun. var. *intermedia* Grun. 13.  
*Navicula lacustrum* Grun. 4.  
*Navicula galathea* Ehr. 13.

- Navicula gastrum* var. *exigua* Grag., 13.  
*Navicula placenta* Ehr., 13.  
*Navicula placentula* Ehr., 5, 8, 13.  
*Navicula radiosa* Kütz., 3, 14.  
*Navicula cuspidata* Kütz., 2, 5, 13.  
*Navicula cuspidata* var. *ambigua* Ehr., 13.  
*Navicula cuspidata* var. *eroticula*, 14.  
*Navicula rhynchocephala* Kütz., 1.  
*Navicula rhynchocephala* var. *amphiceros* (Kütz.) Grun., 3.  
*Navicula commutata* Grun., 4.  
*Navicula peregrina* Kütz., 5, 14.  
*Navicula mutica* var. *Cohnii*, 7.  
*Navicula laevissima* K., 14.  
*Navicula coeonoformis* Grag., 14.  
*Navicula clavicularis* Grag., 14.  
*Navicula inflata* K., 14.  
*Navicula pusilla* Sm., 14.  
*Navicula cryptocephala* K., 14.  
*Navicula lanceolata* Ag., 14.  
*Navicula tumida* Breh., 14.  
*Pinnularia incroscopica* Ehr., 8, 13, 14.  
*Pinnularia divergentissima* Grun., 13.  
*Pinnularia Legumen* Ehr., 13.  
*Pinnularia divergens* W. Sm., 2, 3, 4, 12.  
*Pinnularia divergens* var. *sublinearis* Cleve, 13.  
*Pinnularia episcopalis* Cleve, 2.  
*Pinnularia episcopalis* Cleve var. *brevis* Cleve, 13.  
*Pinnularia bercalis* Ehr., 3, 13, 14.  
*Pinnularia lata* Breh., 1, 8, 13.  
*Pinnularia stauroptera* Grun., 2.  
*Pinnularia stauroptera* var. *interrupta* Cleve, 13.  
*Pinnularia stomatophora* Grun., 13.  
*Pinnularia subsoletis* Grun. var. *linearis* Cleve, 13.  
*Pinnularia hemiptera* Kütz., 8, 6, 12.  
*Pinnularia acrocephala* Breh., 4.  
*Pinnularia acrocephala* Breh. fa. *maxima*, 13.  
*Pinnularia acrocephala* var. *laevis* Cleve, 13.  
*Pinnularia parva* Grag., 3, 6, 8, 13.  
*Pinnularia parva* var. *Novae Zeelandiae* Cleve, 13.  
*Pinnularia major* Kütz., 1, 2, 4, 6, 8, 13, 14.  
*Pinnularia viridis* Kütz., 2, 4, 6, 8, 13, 14.  
*Pinnularia distinguenda* Cleve, 13.  
*Pinnularia gibba*, 3, 4, 6, 14.  
*Pinnularia gibba* var., 3.  
*Pinnularia bracteolata* Grun., 2.  
*Pinnularia legumen* Ehr., 1.  
*Pinnularia appendiculata* (Ag.) Cl. v., 6.  
*Pinnularia appendiculata* var. *condensata* Grun., 1.  
*Pinnularia dactylis* Ehr., 8.  
*Pinnularia Harlekyana* Grun., 2.  
*Pinnularia bracteolata* Cleve var. *serotina*, 4.  
*Pinnularia tenera* AS., 4.  
*Pinnularia eructantia* Sm., 14.  
*Pinnularia viridula* Sm., 14.  
*Pinnularia stauropiformis* Sm., 14.  
*Pinnularia interrupta* Sm., 14.  
*Pinnularia subcapitata* Grag., 14.  
*Amphora ovalis* (Breh.) Kütz., 8, 14.  
*Amphora ovata* var. *pedicularis* Kütz., 13.  
*Amphora renata* Kütz., 13.  
*Amphora Berggrenii* Cleve, 13.  
*Cymbella ventricosa* Kütz., 3, 4, 6, 8, 13.  
*Cymbella cuspidata* Kütz., 13, 14.  
*Cymbella cuspidata* var., 2.  
*Cymbella agilis* Kütz., 1, 13.  
*Cymbella anglica* Lag., 1.  
*Cymbella gastroideus* Kütz., 1.  
*Cymbella amphicephala* Nac., 8.  
*Cymbella australica* (A. Sch.) Grun., 8, 13.  
*Cymbella Costoni* (Rab.) Cleve, 8.  
*Cymbella parva* (W. Sm.) Cleve, 8.  
*Cymbella pusilla* Grun., 4.  
*Cymbella tardidum* Grun., 4, 13.  
*Cymbella naviculiformis* Auerst., 13.  
*Cymbella Jordani* Grun., 14.  
*Cymbella graeffii* Rabh., 13.  
*Cymbella sinuata* Grag., 13.  
*Cymbella tardidula* Grun., 13.

- Cymbella aspera* Ehr., 13.  
*Cymbella tumida* Breb., 13.  
*Cymbella apiculata* 14.  
*Cymbella Lindqvistiana* Grun., 14.  
*Cymbella obtusiuscula* K., 14.  
*Cymbella Hicetia* K., 14.  
*Cymbella lanceolatum* Ehr.,  
*Gomphonema parvulum* Kütz., 7, 8,  
 13.  
*Gomphonema gracile* Ehr., 1  
*Gomphonema gracile* var. *major*  
 Grun. 13.  
*Gomphonema gracile* var. *naviculare*  
 W. Sm., 12.  
*Gomphonema lanceolatum* Ehr., 13.  
*Gomphonema acuminatum* Ehr., 13.  
*Gomphonema Berggrenii* Cleve, 1, 2,  
 3, 4.  
*Gomphonema constrictum* Ehr. 13,  
 14.  
*Gomphonema intricatum*, 0, 14.  
*Gomphonema intricatum* var. *pumila*,  
 3.  
*Gomphonema subulatum* Grun., 4.  
*Gomphonema affine* Kütz., 4.  
*Gomphonema nitris* Ehr., 4, 14.  
*Gomphonema curvatum* K., 14.  
*Gomphonema cristatum* Rab. 14.  
*Gomphonema cagar* Ehr., 14.  
*Gomphonema tenellum* K., 14.  
*Gomphonema dichotomum* K., 14.  
*Gomphonema acutale* Grag., 14.  
*Epithemia sarex* Kütz., 1, 2, 5, 8, 12,  
 14.  
*Epithemia turgida* (Ehr.) Kütz., 8,  
 14.  
*Epithemia zebra* (Ehr.) Kütz., 10,  
 14.  
*Epithemia musculus* Kütz., 14.  
*Epithemia Westermanni* Ehr., 14.  
*Rhopalodia gibba* (Ehr.) O. Müll., 1,  
 0, 14.  
*Rhopalodia ventricosa* (Ehr.) O.  
 Müll., 8.  
*Rhopalodia gibberula* (Ehr.) O.  
 Müll., 1, 2, 3.  
*Rhopalodia Nova Zeelandiae*  
 Hust.<sup>2</sup>  
*Hantzschia amphioxys* (Ehr.) Grun.  
 1, 6, 7, 9, 12.  
*Hantzschia amphioxys* var. *inter-*  
*media* Grun., 12.  
*Nitzschia amphibia* Grun., 1, 7, 0.  
*Nitzschia dubia* W. Sm.  
*Nitzschia Fransenfeldii* Grun., 1, 9.  
*Nitzschia linearis* (Ag.) W. Sm., 1, 9.  
*Nitzschia obtusa* W. Sm. var. *scal-*  
*pellaformis* Grun., 1.  
*Nitzschia palca*, 1.  
*Nitzschia agnia* (Kütz.) W. Sm., 10,  
 12.  
*Nitzschia thermalis* (Ehr.) Auer., 1,  
 9.  
*Nitzschia spectabilis* Ralis., 2.  
*Nitzschia acutiuscula* Grun., 4.  
*Nitzschia signata* W. Sm., 4, 14.  
*Nitzschia parvula* Sm., 14.  
*Nitzschia minutissima* Sm., 14.  
*Nitzschia apothetica* Breb., 14.  
*Triblionella gracilis* Sm., 14.  
*Triblionella dubbia* Kütz., 14.  
*Triblionella angustata* Sm., 14.  
*Triblionella leucomis* Sm., 14.  
*Surirella gracilis* Grun., 3.  
*Surirella ovalis* Breb., 2, 3, 9.  
*Surirella ovalis* var. *magistra* (Kütz.,  
 Van Heur., 1, 8, 9.  
*Surirella ovalis* var. *exerta* O. Müll.,  
 1.  
*Surirella ovalis* var. *Kotachyana*, 3,  
 8, 12.  
*Surirella splendida* (Ehr.) Kütz., 3,  
 8, 14.  
*Surirella linearis* Sm., 14.  
*Surirella linearis* var. *constricta*, 3.  
*Surirella munda* Breb., 3, 14.  
*Surirella ovata* Kütz., 3, 14.  
*Surirella biseriata* Breb., 14.  
*Surirella laevis* Grag.  
*Surirella elegans*, 14.  
*Campylodiscus cribratus* Sm.

<sup>2</sup> A. Schmidt, *Atlas Diatom.* pl. 294, fig. 40.

This list contains 259 different diatoms reported from New Zealand of which 14 are endemic. Several forms seem to me brackish-water species

## LITERATURE CITED

1. CLAY, P. T. On some new and little-known diatoms. *Kongl. Svenska Vetenskaps-Akad. Handl.* Stockholm (35) 18 (1881)
2. CLAY, P. T. Synopsis of the Navicula & Diatoms. Stockholm (1884-1885)
3. CLAY, P. T. *Diatomeenstudien zusammengestellt für einige Freunde.* New York, pp. 1-51
4. GUYVILLE, R. K. Descriptions of new genera and species of diatoms from the South Pacific, I III. *Trans. Bot. Soc. Edinb.* 7, 8 (1863-1865)
5. GUYVILLE, R. K. Descriptions of new and rare diatoms from the Tropics and the Southern Hemisphere. *Trans. Bot. Soc. Edinb.* 8 (1865) 1 pt.
6. LINDSAY, W. LAUDER. On the Diatomaceae of Otago, New Zealand. *Journ. Linn. Soc. Bot. London* 9 (1867)
7. LINDSAY, W. LAUDER. On the Protophyta (Diatomaceae) from New Zealand. *Q. J. M. S. London* 7 (1867)
8. NORSTEDT, OTTO. Fresh-water algae collected by Dr. S. Berggren in New Zealand and Australia. *Kongl. Svenska Vetenskaps-Akad. Handl.* Stockholm (6) 22 (1881)
9. SCHMIDT, A. *Atlas Diatomaceorumkunde.* Leipzig (1875-1881).
10. SKYVOTZOW, B. W. Notes on fossil diatoms from New South Wales, Australia, I. Fossil diatoms from *Corama diatomaceous earth.* 2 P. Unpublished manuscript.
11. TEMPERE et PERACALLA. *Diatomées du Monde Entier* 2d ed. Gironde (1915)
12. DE TONI, G. B. et A. FORM. *Algae di Australia, Tasmania e Nuova Zealana raccolte dal rev. dott. Giuseppe Capra nel 1908-1909.* Mem. Reol. Inst. Veneto di Sc. Lett. ed. Art. Venezia (3) 29 (1923)

## ILLUSTRATION

### TEXT FIGURE

- FIG. 1. a, *Triceratium tripartitum* Cleve (after Cleve), b, *Stephanodiscus Novae Zeelandiae* Cleve (after Cleve), c, *Amphora Berggrenii* Cleve (after Cleve), d, *Diploncia subradiata* Cleve (after Cleve), e, *Naticula Puzos* Cleve (after Cleve), f, g, *Gomphonema Berggrenii* Cleve (after Cleve), h, *Stauroneis reticulata* Gréville (after Gréville), i, *Stauroneis scaphulaeformis* Gréville (after Gréville).



# THE FLYING-FISH INDUSTRY OF THE NORTHWESTERN AND SOUTHWESTERN COASTS OF CEBU

By CLARO MARTIN

*Of the Fish and Game Administration, Bureau of Science, Manila*

## FOUR PLATES

The flying-fish industry of Cebu first came to the notice of the writer during his preliminary survey of the fisheries of Fishery District No. 8 (comprising Oriental Negros, Cebu, and Bohol Provinces) in May and June 1936. The particulars obtained at that time were supplied exclusively by the fishermen. An opportunity to check up on this information came in November 1936, when the investigation reported in the present paper was conducted.

The flying-fish fishery on the southeastern coast of Cebu has been in existence for about 40 years. It was originated by the Dalagueteños (natives of the town of Dalaguete). Floating bobos, or fish pots, were first used. After years of observation of the habits of the flying fish the gill-net method was evolved. The gill net used is the *natural*.

The range of the flying-fish fishery in this part of Cebu is from San Fernando southward to Oslob. Fishing is most intensive in Dalaguete. It appears that years of unrestricted fishing have caused the flying fish fishery of this region to decline. This condition, together with the increase in the number of fishermen, made it necessary for the Dalagueteños to look for new fishing grounds, and they were the first to fish the "voladors" (flying fish) in the towns of Balamban, Asturias, and Taburan in northwestern Cebu, in southwestern Oriental Negros Province, and in southern Bohol Province. In 1936 many fishermen from Dalaguete went to fish in Leyte and Samar Islands, bringing their nests with them.

In places where this fishery exists, fishing for the more common commercial species is generally poor, for the coast line is abrupt and the water deep.

## SPECIES TAKEN

This fishery is not confined to fishing for a single species. While the fishery is devoted primarily to flying fish, half beaks

are also caught in appreciable quantities. A few needle fish are also caught now and then.

The bulk of the catch of flying fish is made up of *baroñgoy*. There are two species that fall under the name of *baroñgoy* *Cypselurus pectoropterus* and *Cypselurus oleolepis*. Flying fish over 20 centimeters long are called *bangse*. Of the two species of *baroñgoy*, *C. oleolepis* forms the major part of the catches. This is true in northwestern as well as in southwestern Cebu.

Mixed with the *baroñgoy* is another species of flying fish, with a much abbreviated pectoral, *Evolastus macropterus*, locally called *lawat*. In most cases *lawat* does not constitute even 1 per cent. of the whole catch in Tabaran. Apparently the same is true in southwestern Cebu.

*Cypselurus butensis*, called *sirihog*, is another species of commercial flying fish. This species can be distinguished from the others by its smaller and shorter head and its long pectoral, the tip of which when folded comes closer to the base of the caudal than those of any other species. *Sirihog* is found mostly in southwestern Cebu, where it is caught by means of a special kind of net and fish pot or *boba*.

Species other than the flying fish are also caught. There are times when as much as one third of the catch consists of halfbeaks or so-called *Hemiramphus* etc. A few needle fish, or *Belone* sp., are also caught.

The catch is generally segregated into three groups. Group 1 includes the large-sized flying fish, from 191 to 270 centimeters long. Group 2 includes fish from 141 to 190 centimeters long. To group 3 belong the small fish, from 91 to 140 centimeters long. If there are plenty of halfbeaks of group 1 or group 2 size they are segregated as group 4. However, if there are very few and are of the same size as those of the first two groups, they are just mixed with these respective groups according to size.

The percentage of group 1 in the catch ranges from 5 to 65. The group 2 size generally predominates in the catch, with a percentage range of from 70 to 90. When group 1 predominates, the percentage of group 2 may be as low as 27. However, this condition occurs only occasionally. For group 3 the range is 2 per cent to 9 per cent. Group 4, if it is represented at all in the catch, includes 4 per cent to 20 per cent of the fishes caught.

## FISHING SEASON

In the towns of Balamban and Tugurana, in northwestern Cebu, the fishing season starts in August and ends in March. Although good weather prevails from April to July, fishing activities are suspended during these months. It has been observed that during this period the fish are generally of group 1 size. Although the fishing season starts in August, when the majority of the fish have attained group 2 size, fishing activities are limited at this time by unfavorable weather conditions due to the southwest monsoon. Brisk fishing begins in October and ends in March.

In the towns of Argao, Dalaguete, Bolnhoon, and Oslob in southwestern Cebu, the fishing season for all kinds of flying fish falls within the period from June to March. Barotogay are plentiful during June, July, August, and September. Fishing activities, however, are limited during July and August by unfavorable weather due to the southeast monsoon. The fishing season for *sirikima* lasts from October to December.

## FISHING METHODS

**Bobo.**—Ordinarily the bobo, or fish pot, is used under water for catching bottom species. Fishermen in southeastern Cebu use the same trap provided, however, with floats to catch the flying fish, which are surface species.

The bobo is a boxlike structure, made in the shape of a rectangle from mats of thin split bamboo, woven with an open hexagonal mesh of about 2 centimeters. On the top are fastened three 1-joint bamboo floats to keep the trap close to the surface of the water. The entrance is made on one of the sides in such a way that the fish cannot escape once it has entered the trap. At the side opposite the entrance a sort of door is provided to facilitate the removal of the fish inside the trap.

When the trap is taken out for fishing, small bunches of seaweeds, *sunzo*, are tied to the sides and top to simulate a bunch of floating seaweed to attract the flying fish, particularly the *sirikima*. The trap is fastened to the baroto of the fishermen with a 50-meter line.

**Gill net.**—Two types of gill nets are used, the one-man gill net and the large *gal* net. Both types of net are called *panurikima*.

Not for catching *sirikima*.

The one-man type is a small gill net, 4 meters deep and 14 meters long. This net is home-made, woven from No. 40 thread with a 3.4 cm (stretched) mesh. This net is provided with floats 4 cm in diameter, 14 cm long and 30 centimeters apart. Stone weights set 45 centimeters apart are used on the lead line. The net is dyed light blue.

The other type of pantrakinia is a large net composed of 10 pieces of the same material and made like the one-man pantrakinia. The pieces, measuring 7 meters each are interlaced end to end.

The operation of this net requires seven to twelve *barotos*. One of these *barotos*, called *pukutan*, is large and manned by two men. The net is carried in this *baroto*. The other *barotos* are small and manned each by a single individual. One of these serves as the *lawitan*, the boat in which one end of the net is accommodated. In actual fishing the man on the *lawitan* takes charge of one end of the net. The rest of the men are called *abugan*, or drivers. There must be at least five *abugan*.

Fishing is done at daytime, always in the morning. The fishermen start for the fishing ground at dawn. At the fishing ground the net is spread across the current, which must not be very strong. One end of the net is dropped from the *pukutan* and picked up by one man on the *lawitan*, who ties it to the *baroto*. Then both the *pukutan* and the *lawitan* are steered in opposite directions until the entire length of the net is spread out. The *abugan* deployed in the form of a semicircle by this time are about a mile or more away from the net moving toward the net and driving the flying fish toward it by throwing stones forward to scare the fish.

*Pamarongoy*.—The *pamarongoy*<sup>1</sup> is a purse seine. This seine varies in length from 230 to 500 meters and is 16 meters or more deep at the bunt. It is provided with a 7-mesh scavage of No. 40 netting all around.

The net is composed of two parts, the wings, or *palaspas*, and the bunt, or *sigam*. The length of the wing portion varies from 70 to 80 meters. The netting used in the wings is handwoven from No. 20 thread with a mesh of 2.5 centimeters. The bunt is composed of five parts. The middle portion is of No. 4 net-

<sup>1</sup>A narrow canoe-like boat with a high sharp cutwater provided with outriggers, and invariably fitted with a sail.

<sup>2</sup>Not for catching *horongoy*.

<sup>3</sup>The numbers of the twines and netting mentioned here are taken from the Aguinaldo Catalogue.

ting with a mesh of 17 centimeters. Next to this on each side is a strip of No. 21 netting of 1.5 centimeters mesh but of lighter twine. This strip is followed on the outer edge on each side by another of No. 29 netting of 2 centimeters mesh.

The middle portion of the bunt is the deepest part of the net—10 meters from the float line down to the lead line. From this portion the net narrows toward the end of the wing which is 6 meters wide. A wing bridle provided with a loop is fastened at the end of the wing. At the wings the floats are small, 6 centimeters in diameter and 7.5 centimeters long, and placed at intervals of 30 to 40 centimeters. At the bunt the floats are larger, 9 centimeters in diameter and 14.5 centimeters long. The floats are closer together at the middle portion of the bunt. Baked clay weights 4 by 3 centimeters and spaced at intervals of 37 to 40 centimeters, serve as leads. Hanging by means of a strong twine 20 to 27 centimeters long from the lead line are the brass rings, 7 centimeters in diameter. There are altogether 64 of these brass rings, spaced at intervals of 1.40 meters to 1.65 meters. There are two purse lines, one end of each of which is fastened to the middle of the lead line. From there the two purse lines run in opposite directions, passing through the rings. The other ends of the purse lines are then tied each to the farthest ring directly fastened to the lead line about 30 meters from the end of the wing.

The operation of this net requires at least fifty men. One large sailboat (*banca*), a fast delivery sailboat (*tumuran*), a three-passenger baroto for lawitan, and at least twenty small barotos for abugan, are used. The *banca*, manned by ten men, is used to carry the net to the fishing ground. The men here include the leader of the entire outfit. The *tumuran* is included among the barotos used by the drivers. Speed is the important characteristic of a *tumuran* for delivering the catch to the shore. The lawitan is the baroto used by three men who take care of one end of the net when spread.

At about 2.30 A. M. the leader of the outfit begins to sound the call for his men with his shell (*terbo*) trumpet, locally called *budlong*. Each outfit has its distinctive call notes. After half an hour the *banca* and the lawitan leave the shore for the fishing grounds. The *banca* is equipped with a signal lamp for the abugan to follow, and the leader keeps sounding the outfit's call on the shell trumpet to keep the rest of the outfit aware of the *banca's* position.

The drivers in their respective barotas leave the shore usually about an hour later, when the banca is a ready quite far away. Before the sun rises, or even earlier, the drivers, arranged in a large semicircle, advance toward the position of the banca. They then begin to drive the unseen fish by throwing stones sideways and forward as they advance.

At the sight of the approaching drivers the leader orders the spread of the net. Two men pay out the piled net while one sees to it that it is not twisted. As the net is paid out, the banca is rowed forward and steered into a position that will not interfere with the spread of the net. The other end of the net is taken by a man in the lawitan who ties the *bahan*, or scare line, to the loop of the bridle line. The *bahan* is a 9.5-inch hemp rope about 100 meters long, with heavy palm fronds inserted through the strands at intervals of about 1 meter. The other end of this scare line is fastened to the base of the mast of the lawitan. Before the other end of the net is let out, one end of the other scare line is fastened to the loop of the bridle line and the other end to the base of the mast of the banca. In the resulting position the net takes the shape of an arc, with the banca at one end and the lawitan at the other. Stones are thrown every now and then in the direction of the scare line and the gap between the men and the approaching leader of the drivers. As the drivers advance towards the net, they close and complete the circle. The circle is made smaller and smaller as the drivers advance toward the net to take hold of the float line. Others tie their barotas to the scare line and take to the water with their diving goggles to see to it that the fish do not escape. Meanwhile the banca and the lawitan approach each other. A 10-meter rope from the lawitan is fastened to the prow of the banca. The scare lines by this time are being pulled in. When the bridle line is reached at the lawitan this end of the net is passed to the men at the prow of the banca, where it is hauled in, the other end is collected at the middle portion of the banca. When the ends of the purse lines come to hand they are unfastened from the ring and slipped through the pursing blocks of the purse weight or tom (*lupote*). The latter is then immediately lowered and suspended from a purse weight line about 8 meters below the banca. As soon as this is done the purse lines are pulled in while the ends of the net are hauled in. When the bottom of the bunt is already pursed, the purse lines and the purse-weight line are pulled together to

bring the lead line of the bunt to the banca. The bunt is made smaller and smaller as the net is collected on the banca. The flying fish are dipped from the bunt right into jute sacks. A small portion is left for the fishermen to divide among themselves.

As soon as the fish are placed in the sacks these are placed on the tumuran which rushes them to the shore. If another haul of the net is made, the second fastest sailboat in the outfit delivers the catch to the shore.

#### HANDLING AND MARKETING

As it takes but a short time—an hour to an hour and a half—for the tumuran to get to the shore, the fish is subjected to no special handling in transit.

Upon arrival at the shore the tumuran is met by the women retailers, vendors who vie with each other in the acquisition of the fish first landed, as these command a higher price on the market.

The sacks in which the fish are carried are not uniform in size, they range from the smallest, with a capacity of about 2,000 living fish of group 2 size to the largest, with a capacity of about 3,000.

When the catch is abundant, the fish are sold by the sack, but if it is meager they are sold by the hundred. The price ranges from 5.50 pesos<sup>2</sup> to 6 pesos per sack of 1,900 to a little over 2,000 fish. During scarcity the price per hundred goes up to 50 centavos, and the fish are retailed 8 fish of group 2 for 5 centavos and 3 fish of group 1 for 5 centavos. During the peak of the catch in 1935 the price level is said to have gone down to as low as 40 centavos per petroleumcanful, about one-fourth the capacity of one sack of the kind ordinarily used.

When the catch is plentiful the fish are shipped to neighboring towns.

#### PRESERVATION

When the catches are not entirely disposed of by 3 P. M. the surplus is preserved in various forms.

*Pinakas*.—In this method of preservation the fish is split on the back from the mouth down to the base of the tail, and the entrails removed. Then, after the fish has been washed, it is salted and laid flat on the belly in layers in a container. The following day and thereafter the salted fish are dried under the sun.

<sup>2</sup> One peso equals 50 cents United States currency.

**Tinabat.**—In this method the fish are thoroughly mixed with salt, and placed in gasoline or petroleum cans with a thick layer of salt on top. The fish are thus allowed to remain in their own pickle.

**Tinapan.**—According to the tinapan method the fish are washed and strung through the eyes with rods about 1 meter long. Each rod carries 25 to 28 fish.

The strung fish are then placed over smoldering coconut fuel to be roasted. The arrangement is changed at least 4 times in order to give the fish a uniform cooking and coloration. It takes an hour or less to complete the cooking.

The process renders the fish hard and practically dry. The product is known to keep for a week at least.

#### NOTES ON THE SPAWNING HABITS OF FLYING FISH

In Tuburan fishermen have observed that in April, May and June the flying fish caught are generally small—10 centimeters long at most. These fingerlings are probably hatched about December or January. In November adults (group 1) of *Cypselurus* in Tuburan were found to have mature ova and the ova of group 2 fish are in the process of development. November 18, 1935, while taking measurements of the pamaronogoy net, the writer in several parts of the net came across clusters of eggs entangled in a mass of long tough filaments. Upon close examination these eggs were found to bear close resemblance to those found and described by Hornell from Coromandel Coast.<sup>1</sup> He says:

The pool was plain; the branches and leaves of the shrub were full of tangled-up multitudes of tiny colourless eggs with innumerable glassy threads, tough and elastic, attaching them in masses to one another and also the leaves and branches of the plant. The eggs were devoid of colour, transparent save at one pole, where a tiny opaque white disk, the blastoderm area, was distinguishable.

A detailed microscopic examination and observation of the development of the eggs by Hornell were made by Nayadu<sup>2</sup> who gave the following:

They are almost spherical, 1.75 to 1.8 mm. in diameter, and are very tough and resilient, rebounding like an india-rubber ball when struck against any hard surface.

<sup>1</sup>Hornell James. The Flying-fish Fishery of the Coromandel Coast. Bull. No. 16, Fishery Reports for 1922. Madras Fish Dept. (1923) 99-109.

<sup>2</sup>Nayadu, M. Ramaswami. A note on the eggs and early embryonic development of *Cypselurus*. Ibid., 109-112.



They are attached to floating objects and to one another by means of hyaline filaments issuing from the surface of the egg membrane. These filaments are of three kinds, first, one single filament, the stoutest and the longest, which is the egg's main anchoring cable, second, a tuft of 7 to 16 tiny thin short ones exactly at the opposite pole, and third 4 to 8 medium-sized ones which form side stays. The function of the tuft of tiny filaments is not known as in all the eggs examined they were free and unattached. The egg is ever slightly elongated towards the pole from which the stout long filament issues. When the eggs are attached only to one another the main and the side stays are placed together to form a stout central cord of considerable length, consisting of several thin filaments, from which the eggs project on all sides in the manner of grapes in a bunch in which case the stem of the bunch will represent the stout central cord of the mass of eggs.

*Cypselurus* species in southwestern Cebu are also observed to bear eggs in November, December, and January. While examining a bobo panirikina December 18 the writer again came across clusters of eggs very similar to those seen in Tuburan attached to seaweeds fastened to the sides of the bobo. From June to as late as September a large quantity of flying fish fingerlings locally called *atpounghoc*, are caught mixed with the commercial catch.

## ILLUSTRATIONS

### PLATE 1

- FIG. 1. The drivers (abugun) coming close to the net with some of the  
nets (marked A) swimming.  
2 The barots that were used by the drivers tied to the banca.  
3 The seave line (babun) being pulled on the banca.

### PLATE 2

- FIG. 1 A typical tamaran.  
2 The drivers coming home from the fishing ground.  
3 The banca with the fishermen.

### PLATE 3

- FIG. 1. The punnuroñgoy being carried to shore for drying.  
2 The punnuroñgoy being spread on the drying yard.  
3 The punnuroñgoy spread to dry.

### PLATE 4

- FIG. 1 Betan fish vendors counting the fish contained in a sack.  
2 Making binapua.



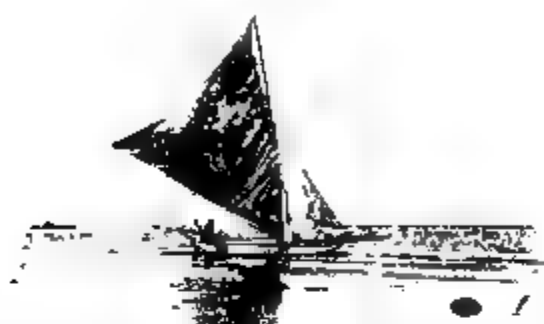




PLATE 2



PLATE 1

# TUNA FISHERY AND LONG-LINE FISHING IN DAVAO GULF, PHILIPPINES

By CLARO MARTIN

*Of the Fish and Game Administration, Bureau of Science, Manila*

SEVEN PLATES AND TWO TEXT FIGURES

The possibilities of the tuna fishery of Davao Gulf have long been known to a few old resident Japanese fishermen, one of whom possesses a good knowledge of the tuna fishing grounds and the source of herring for bait in southern Mindanao as far as Zamboanga Province. In 1929 an enterprising American who saw conditions in the locality went to San Diego, California, to induce tuna packers there to finance a tuna canning plant in the town of Malita, Davao Province; however, nothing has been heard of this man since. In 1934 the Philippine Packing Corporation by means of the expensive modern fishing boat "Defender" made a survey of the Gulf as a possible source of tuna for their plant at Bogo, Misamis Oriental Province. In the same year the "Shonan Maru," the experimental fishing boat of the Formosa Government Fishery Experimental Station, touched the port at Davao in its survey of the tuna fisheries of the Celebes Sea. Information obtained from the technical men in the boat by the Japanese fishermen opened the eyes of the latter to the potentialities of the fishery. The exploitation of the fishery, however, did not begin until December, 1936, with the operation of the launch of Davao Fishery, Incorporated. The attention of other Japanese fishermen was drawn to the new fishery, and now several launches are operating.

Since the fishery is new in the locality, and the fishing methods employed are also new in the Philippines, both are described in the present paper.

## SPECIES TAKEN

There are two principal commercial species of tuna caught in Davao Gulf. The skipjack, locally called *tutāngan* (*Katsuwonus pelamis*), is the most abundant of the three, and therefore may be regarded as the most important. It is caught by pole and line. The other species is the yellowfin, or *bareles* (*Ne-*

*Thunnus macropterus*) The yellowfin caught in Davao Gulf has the second dorsal and anal much elongated. This variety, according to Kishinouye,<sup>1</sup> is known in Japan as *toshibi*, and is a variety of the true yellowfin. Jordan and Evermann,<sup>2</sup> however, regarded this variety as a new and distinct species and named it *Neothunnus toshibi*. The yellowfins are caught both by pole and line and by long line. One species of bonito (*Euthynnus yatei*) is also caught in good quantities, in fish corrals and by large beach seines.

While long line fishing is principally intended for the yellowfins, spearfish, sa' fish, large mackerels, and sharks are also caught, and comprise the by-product of the fishery. The spearfish (*Tetrapterus* sp.) and the sa' fish (*Istiophorus* sp.) have not been definitely identified to the species. Two distinct species of mackerels (*Cyburn commerson* and *Acanthocybium solandri*) are sometimes caught. Two species of sharks of the genus *Carcharias* are often caught.

#### FISHING SEASON

Davao Gulf is within latitudes below the typhoon zone and is not much affected by the change of the monsoons. The period from July to October, however, is considered unfavorable for fishing, although all the tuna fishing motorboats have been operating continuously during those months, and the activities of the tuna fishermen are not stopped unless the gulf is disturbed by choppy seas caused by unusually strong winds.

The record of catch of the motorboat "Nora" shows that this boat has been in continuous operation from December, 1936, to December, 1937. From a peak of 14,513 kilograms in June the amount of catch has fallen to 8,976 in July, 7,966 in August, and 5,453 in September; and recovered a little in October with 8,501 kilograms. Poor fishing most often is caused by failure to catch herring for bait. During the period from July to October herring are quite scarce in the vicinity of Davao. The same record also shows that there are much more small yellowfins caught mixed with the striped tunas in March and April than in any other month. Big yellowfins were also being caught continuously since February by long-line outfits.

Contributions to the comparative study of the so-called scomberoid fishes. Journ. Coll. Agric. (3) 8 (1923) 293-475.

<sup>2</sup>A review of the giant mackerel-like fishes, tunas, spearfishes and swordfishes. Occ. Papers Calif. Ac. Sci. (12) (1926) 5-12.



As the fishery is still in its infancy and the data are very meager it seems premature to draw conclusions as to the season for tuna fishing.

#### FISHING GROUNDS

Definite portions of the Gulf of Davao have been found by the tuna fishermen to yield good catches of each of the two principal species of tunas found in the Gulf (text fig. 1). The skipjack is found in the waters north, south, and west of Samal Island. Although large schools of skipjack are frequently seen north of Samal Island, the large tuna outfits, using pole and line with live baits, do not operate in this portion of the Gulf. It is claimed by these fishermen that it is hard to charm the fish in this part, due to comparatively heavy traffic there which tends to make the fish watchful and wild. This place, however, is the main fishing ground of the troll-line fishermen from Samal Island. The western half of the Gulf from south of Tahcod and Samal Islands to north of Manda constitutes the main fishing ground for skipjack. Small immature yellowfins from 3 kilograms to about 15 kilograms in weight are also caught in the same fishing ground with the skipjack.

The main fishing ground for yellowfins is the eastern two-thirds of the entrance to the Gulf from off Monserrat to within twenty miles south of Cape San Agustin. The western part of the entrance of the Gulf did not prove to be a good fishing ground for yellowfin. It was found that more yellowfin could be caught further outside the Gulf, but on account of the size of the craft the operation is limited to within a radius of twenty miles from Port San Agustin.

Together with the yellowfins, spearfish, sailfish, and several species of sharks are caught in the same fishing ground.

#### THE TUNA FISHING MOTORBOATS

There are two kinds of fishing motorboats used in tuna fishing in Davao Gulf. The motorboats used in pole-and-line fishing for striped tuna are provided on the foredeck with compartments used for live well. The bottom of these compartments is provided with holes for the entrance and circulation of sea water when the fish are in. The live well is also used for stowing the catch when fishing is over. Fitted along the larboard side of the boat from bow to stern is a 1-inch pipe line. This is connected to a pump placed on the top of the engine house

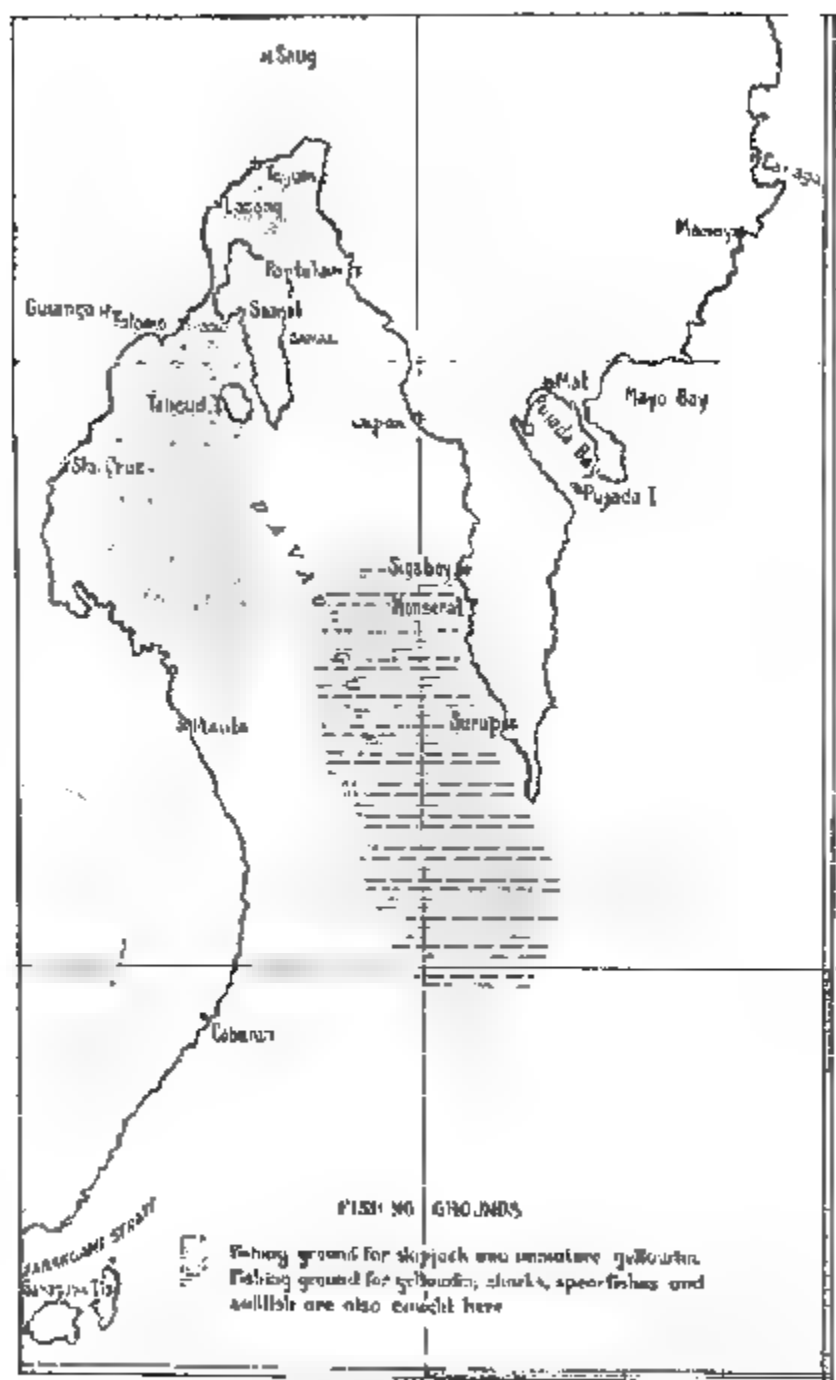


Fig. Fishing grounds of the tuna fishery of Oceanic Co.

and geared to the main engine. The pipe line is tapped at several places at the bow and stern portions and fitted with spraying fixtures. The pump and the tapped pipe line serve to create the water spray, water being pumped from the live well during actual fishing.

The crew of a pole and line fishing motorboat is composed of one *patron* (or boat master), one engineer, and 12 to 18 men. This number is, however, dependent upon the tonnage of the boat.

The long-line tuna motorboats are all small craft of below three tons gross, powered by at least a 20-H. P. engine. The foredeck is clear and provided with an insulated hold. The insulation consists of sawdust and tar paper. In this hold is deposited the crushed ice that serves as refrigeration for the bait as well as for the catch. In all the newly constructed boats the baskets for long line fishing are placed on the foredeck, the rest of the space, covered with tarpaulin in the evening, furnishes sleeping space for the fishermen. The crew usually consists of six men, one acting as engineer and the rest fishermen.

All motorboats except one the "Lamidan," are Japanese-owned. Most of the fishermen are Japanese, although a few are Filipinos, natives of Bohol. The Japanese fishermen are paid on partition basis. After all running expenses and maintenance costs have been paid 60 per cent of the net income goes to the fishermen, and 40 per cent to the owner of the outfit. The Filipino fishermen are paid from 12 pesos<sup>1</sup> to 18 pesos a month with free food.

TABLE 1.—Tonnage measurements, and methods of fishing of various fishing motorboats.

Boat	Gross tons	Net tons	Length	Width	Depth	Method of fishing
			m.	m.	m.	
"Neos"	23.03	12.48	11.60	2.99	1.50	Pole and line
"Mevitz"	2.78	.29	3.00	1.52	0.99	Long line
"Masine"	2.34	1.00	3.53	1.05	0.85	Pole and line
"Mayon"	2.9	2.02	7.32	1.05	0.92	Long line
"Marika"	1.17	1.05	10.03	1.05	0.81	Pole and line
"Lamidan"	4.13	3.69	10.31	2.53	1.10	Pole and line
"Ravies"	2.97	2.02	4.56	1.00	0.80	Long line
"Padoda"	2.98	2.02	10.28	2.22	0.78	Pole and line
"Tatoma"	2.10	1.05	10.70	2.00	0.91	Long line

<sup>1</sup> Changed to long-line method in November.

<sup>2</sup> One peso equals 50 cents United States currency.

## FISHING METHODS

**Troll line.**—Troll-line fishing for striped tunas is engaged in by a number of fishermen from Samal Island, Bunawan, and Talomo, using small one-man craft especially built for speed having sharp bottoms and outriggers. The fishermen follow the school of fish in their boats and drag their baited hooks and lines in the midst of the school (sometimes to the annoyance of the pole-and-line fishermen).

**Fish corral.** Stray and mostly small immature striped tunas and bonitos are also caught in shallow water fish corrals. A large deep-water fish corral specially for catching tuna has just recently been constructed at Talomo by a professional Batangas corral fisherman; it is about 12 fathoms deep and the style is *kinorona*.\*

**Seines.**—The loritos and small striped tunas that come close to shore are also caught in large beach seines having a length of more than 100 meters. The Davao Fishery Incorporated is contemplating to use a purse seine for catching lorito.

**Pole and line.**—Pole-and-line fishing for both striped tunas and small yellowfin is carried on by means of poles ranging from about 3 to 23 gross tons.

In this method of fishing each of the fishermen—numbering from twelve to fifteen—is provided with a pole 2.5 meters long. To the distal end of the pole are fastened two lines about three meters long. These two lines each carry different barbed hooks. The shank of one of the hooks is provided with solid tin molded in the shape of a small fish, dressed with white feathers in the hind portion. The other hook is a simple angular one. A piece of gunny sack is rolled around the portion about 1 foot above the lower end of the pole to provide a good hold and for sticking the hooks when not in use.

The launch leaves the shore before dawn. The first thing done is the securing of live herring to be used as bait, these are bought from the herring fishermen who keep them in large floating dip nets for the pole-and-line fishermen. The live herring are received and kept in the live well of the launch.

As soon as the bait is obtained, when the sun is just rising the launch starts cruising to locate the schools of fish in the fishing ground. About two hundred meters from the sighted school one man starts to throw bait, one or two herring at a

\* Same as *lirati*, described by Talavera and Montalban. Philip. Journ. Sci. 48 (1932) 459.

time, to attract the fish, increasing the amount, though sparingly, as the fish are attracted. The boat is stopped but the engine is kept on to run the pump. The water spray is turned on and the fishermen already at their posts begin fishing using first the feathered hook. The fall of the water spray serves to simulate the commotion of a school of small fish, and also serves as a screen to hide the activity of the fishermen from the fish. As soon as the fish are noticed not to bite the feathered hook anymore, the fishermen change to the plain hook baited with fresh herring. When a large school is encountered, a ton of fish can be landed in a half hour. Fishing goes on as long as there is bait and as long as the school of fish does not leave. When fishing is over the launch is turned homeward. The fish are washed of blood and slime on deck and stowed in the live well, the holes of the latter are plugged at this time.

*Long line.*—Before leaving for the fishing ground for long-line fishing, the hold of the motorboat is filled with crushed ice. The bait, which may be small mackerel (*Rastrelliger chysouma*) or small mullet (*Chanos chanos*) contained in wooden slat trays are stowed in the ice hold.

Strong, stout, cotton twine,  $\frac{1}{4}$  inch in diameter is used in long line fishing. The twine is dyed with *tañgal* (*Cerisea tagna*) bark. Each fishing motorboat carries 10 to 14 baskets of long line (text fig. 2). The long line in one basket varies in length in different boats from 475 to 915 meters. Being a drift line it is supported by float lines, commonly four in number, 18 to 25 meters long and fastened to either a cylindrical wooden float or a spherical glass buoy. The float lines generally divide the long line into three sections. Usually three gangings, each ranging in length from about 45 to about 62 meters, are suspended from each section. The lower end of the ganging to which the hook is fastened is a stranded (19 strands) steel wire 2 to 3 meters long. Two kinds of hooks are used, one rounded, the other ellipsoidal. Flags to determine the location of the line and for identification are also indispensable accessories of the long line. Extra hooks and line, butchering implements and a small harpoon are also taken along in the boat. The small harpoon is used in case the catch is a big fish, a shark, or a spearfish, which are difficult to land.

During the entire period of the trip, which takes from three to five days, the boats stay always at sea. As there is no anchorage on the shores close to the fishing grounds, the fisher-

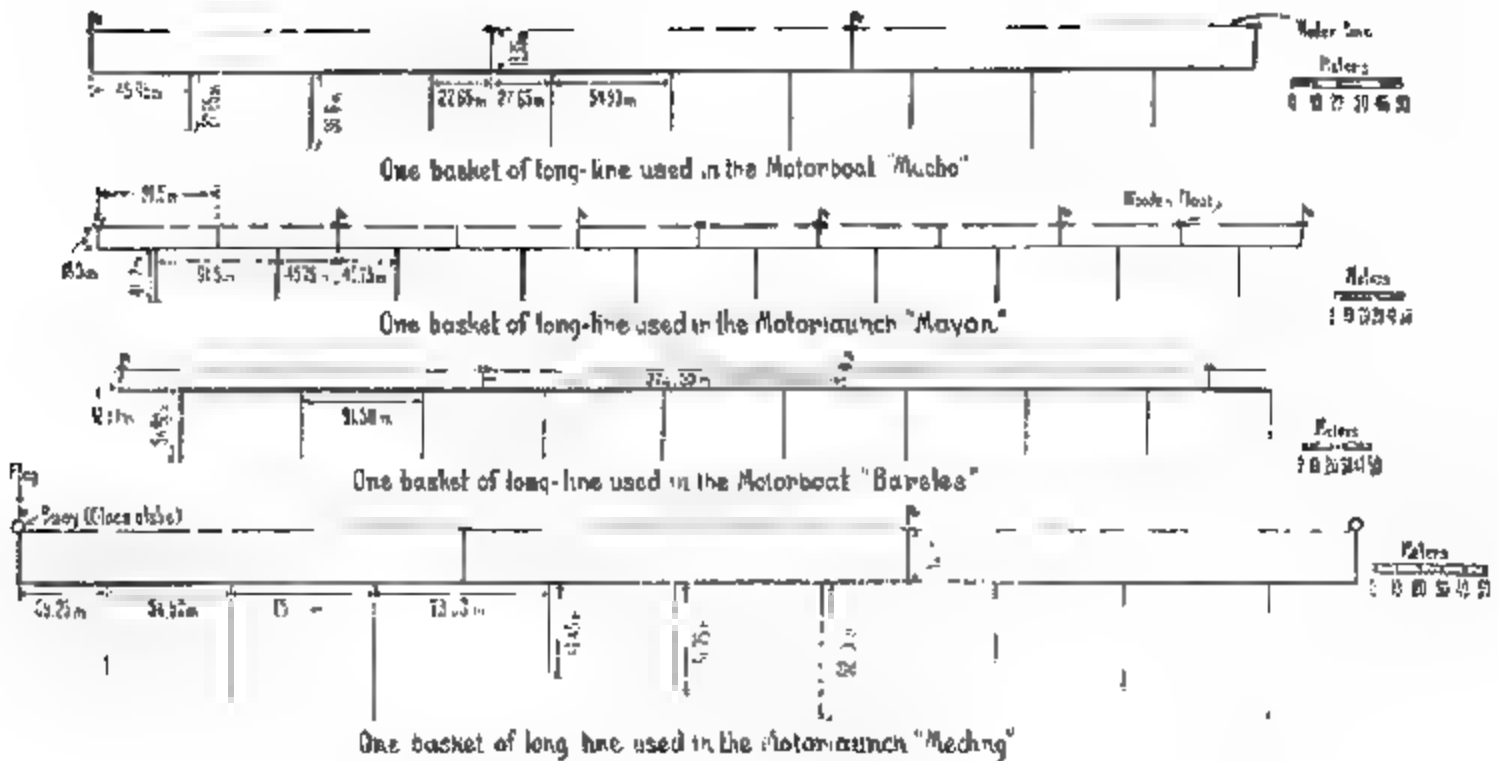


FIG. 2. Arrangement of long lines

men pass the night with the boat drifting some distance from the shore.

The fishermen start the boat early to the fishing ground. At sunrise setting of the long line begins. By this time the boat is about seven to eight miles off the nearest coast, or even farther. The line is set east to west or east to southwest and across the flow of the current at the entrance of the Gulf.

The setting of the line is done on the stern. The engine is run at half speed. A flag and a glass buoy are fastened to one end of the main line of the first basket and thrown overboard. The line is paid out as the boat runs. A fisherman takes charge of paying out the main line. One fisherman takes charge of baiting the hooks of the branch line. Another takes charge of fastening the floats and flags to the float line. The branch line carrying the hook, dressed with the bait, is thrown on the left side and the float line on the right, both at the proper time. Not all floats or buoys are provided with flags. If the first buoy carries a flag, the one following is without, and so on, alternating one with and one without. The line of one basket is joined end to end to that of another until all the lines are set in a continuous long line of several miles. The setting of the long line takes about one and a half hours. After this operation the boat is steered windward more than a mile from the set line. The line is gone over for the catch two times in the morning, and once in the afternoon, and then hauled in for coaling in the baskets at 3 P. M. or 4 P. M. The hauling in of the line consumes four and a half hours at most.

In going over the line for the catch the boat is steered from one end of the long line to another. A float or buoy submerged or partly submerged due to the weight or the pull of the catch is a sign for the boat to stop. The particular float or buoy is pulled to bring the main line on deck. The end of the line which pulls heavily suggests the direction in which the catch is to be found. The hauling of the line and the landing of the catch is done on the bow.

#### HANDLING AND MARKETING

Fish caught by the pole-and line outfits are not iced on the boat, as the fishing ground is not very far from Davao the home port of all tuna fishing motorboats and the distributing center of fish in the northwestern part of the Gulf. On arrival at the landing the boat is met by retailers. Fish that are not disposed of are kept iced in large ice boxes with three to five

compartments. The ice boxes are made by the fishermen themselves. A square opening wide enough for a man to pass through is cut on top of each compartment. The insulation is of sawdust and tarred paper. Galvanized sheet iron is used as the lining inside. Fish can be kept five days at most in these boxes, although the fish are disposed of before this time is reached, as they soften on the fourth or fifth day and constitute a loss.

In long-line fishing large-sized fish weighing from 30 up to more than 200 kilograms, constitute the catch. The yellowfins and spearfish are butchered and cleaned soon after landing. The fins are cut off, the head severed, and the belly eviscerated. The head, although not sold, is saved for the table of the fishermen. It is parted in two its gills removed, and washed clean. The butchered fish and heads soon after cleaning are stowed in the insulated hold, laid side by side, and packed well with crushed ice. Not infrequently yellowfins half-eaten up by sharks are landed. In this case the fish is not thrown away and what parts are utilizable are saved. Usually sharks are caught primarily for the fins. Sometimes, however, the meat is cut into narrow strips which are salted. These salted strips of shark meat are placed in sacks, which, however are not stowed in the hold as the strong fishy odor of the shark meat might impair the quality of the other fish in the hold.

Upon return to port the fish are transferred to the cold storage warehouse of the Davao Ice Plant Company, whence they are disposed of to the retail vendors.

Skipjacks are sold to the vendors in the round and by weight. Some vendors sell their fish in the market stalls others peddle them on their shoulders. The peddler always carries a bowl for cutting the fish into slices, and a balance for weighing the slices. Ordinarily skipjacks are bought by the vendors at from 15 to 20 centavos a kilogram and retailed at from 25 to 30 centavos. Yellowfin tuna and spearfish are bought by the vendors at from 30 to 35 centavos per kilogram, and retailed at from 50 to 60 centavos a kilogram.

#### REMARKS

Nowhere in the Philippines except in Zamboanga Province, where there is a small tuna canning plant, is the tuna fishery as important as in Davao Gulf, due to the fact that all the catch is disposed of in the fresh-fish markets. Approximately 80 per cent of the skipjacks, yellowfins, and spearfish landed in Davao are consumed by Japanese residents.



## ILLUSTRATIONS

### PLATE 1

- FIG. 1 The "Lamidan," a pole-and-line fishing motorboat which after one month operation was converted into a long-line outfit.  
2. The "Nema" a 23-ton pole-and-line fishing motorboat.  
3. The two live wells of the "Nema" The length of the live wells may be appreciated by noting the man inside.

### PLATE 2

- FIG. 1. A fisherman throwing live sardine bait to keep the school of skip-jack closer alongside of the "Nema."  
2. Fishermen in action at the bow of the "Nema."  
3. Fishermen in action at the stern of the same boat.

### PLATE 3

- FIG. 1 The catch at the bow of the "Nema."  
2 The catch at the stern of the same boat.  
3. The catch of the "Nema" being taken at the landing by retail vendors.

### PLATE 4

- FIG. 1. The "Meding," a long-line fishing motorboat all set for the trip to the fishing ground.  
2 Baskets of long line on the deck of the "Meding", note also the spherical glass buoys.  
3 Fishermen of the "Meding," setting the long line early in the morning.

### PLATE 5

- FIG. 1. A yellowfin tuna just landed.  
2. Pulling a ganging or branch line with a catch.  
3. A spearfish being butchered.

### PLATE 6

- FIG. 1. Hauling in the long line in the afternoon.  
2. Spherical glass buoy used in the "Meding."  
3. Ring and the spherical glass buoy marking one end of the long line.

### PLATE 7

- FIG. 1 Two kinds of hooks used in pole-and-line fishing.  
2. Twine used in long-line fishing.  
3. Two kinds of hooks used in long-line fishing; note the sewing (stainless steel) wire.

### TEXT FIGURES

- FIG. 1. Fishing grounds of the tuna fishery of Davao Gulf.  
2. Arrangement of long lines

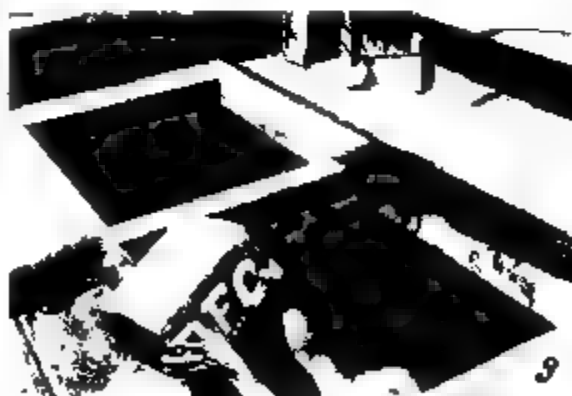




PLATE 2



PLATE 3

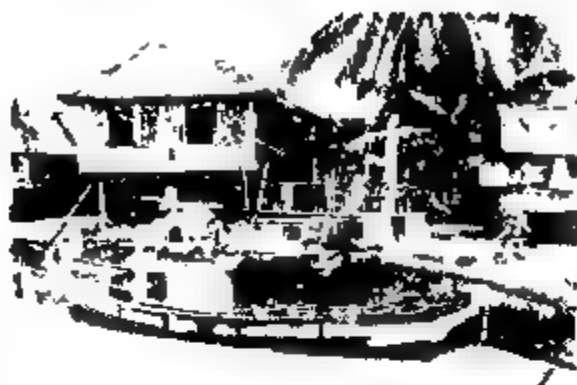




PLATE 5.



PLATE 6.

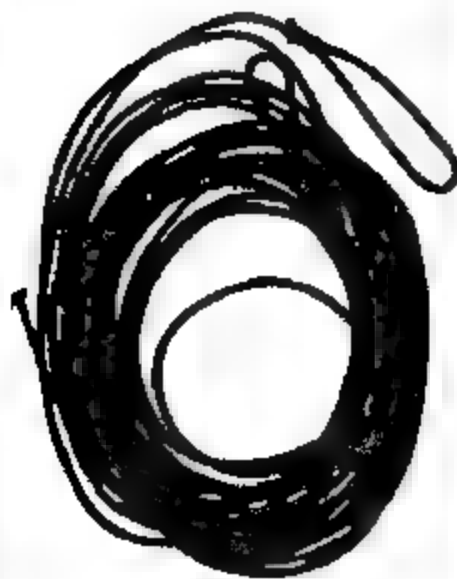


PLATE 3



## A NEW SPECIES OF PALÆMON FROM NORTHERN LUZON

By GUILLERMO J. BLANCO

*Of the Fish and Game Administration, Bureau of Science, Manila*

ON PLATE

In this paper is given the description of a new macrurus crustacean, *Palæmon luzonensis* sp. nov. This commercial shrimp, known in Iloko as *aramang*, is taken in large quantities at the mouth of Cagayan River from August to January. A small drag seine (*bannan*) is used in catching the *aramang* with the aid of a small boat (*balasang*).

The shrimps are usually dried in the sun along the beach, but during the rainy season they are generally salted and fermented into *bangung*. The value of dried and salted products from the *aramang* fishery of Cagayan is estimated at 10,000 to 15,000 pesos annually. Dried *aramang* is packed in boxes or sacks and shipped to Manila and the Iloco provinces, mostly by Chinese but also by a few Filipino dealers. From September to December 1937, about 720 cavans or 54,000 liters of *aramang*, valued at 1,320 pesos, were shipped to Manila and the Iloco provinces. So far there is no record of the value of dried *aramang* and *bangung* made of *aramang* sold in the interior towns of Cagayan Valley.

Genus PALÆMON Fabricius

Rostrum well developed, laterally compressed, toothed above and below. Carapace smooth, furnished with antenna and branchiostegal spines. Pterigostomial spine wanting. Mandible with three-jointed palp.

*PALÆMON LUZONENSIS* sp. nov. Plate 1, figs. 1 to 11.

Carapace provided with an antennal and branchiostegal spine. Supraorbital and hepatic spine absent, pterigostomial angle rounded, without spine. Rostrum long, thin distinctly curved upwards, laterally compressed, distal tip reaching beyond end

One peso equals 50 cents United States currency.

\* One cavan equals 25 gantas or 75 liters

of antennal scale, dorsal border above orbital notch armed with six to seven teeth, four to five teeth on carapace, two on declining ridge, one near lip, ventral border with four widely spaced teeth (Plate 1, fig. 1). Eyes slender, two times as long as wide; breadth of cornea 2.5 times dorsal length of eye, ocellus well marked (Plate 1, fig. 2). Basal segment of first antennular peduncle with well-developed terminal spine (Plate 1, fig. 3). Outer antennular flagellum bifid, shorter branch unsegmented. Flagella of first antennae 1.75 times as long as entire length of shrimp. Antennal scale (Plate 1, fig. 1) three times as long as wide, not tapering; outer margin straight, terminating in an acute spine which does not reach beyond end of lamella. Mandible with strong molar and incisor process and isolated palp (Plate 1, fig. 5). Maxilla cross-shaped, distal margin of outer lacinia with hairs, endopodite with a thin subcapitulum process terminating in long setae (Plate 1, fig. 6). Third maxilliped usually with five articulations and reaching beyond perus of first leg terminal joint with long hair process (Plate 1, fig. 8). First pair of pereopods chelate (Plate 1, fig. 9) reaching beyond antennal scale, chela carpus, and merus unequal in length. Fingers 1.5 times as long as palm, with tufts of hairs. Second pair of pereopods chelate (Plate 1, fig. 10) robust, two times as long as first, reaching beyond rostrum by length of chela. Fingers curved at tips, with straight cutting edges provided with several minute teeth. Fingers 1.75 times as long as palm, carpus 2.66 in merus, no spines on their distal border.

Body slightly compressed laterally, dorsally rounded.

Third, fourth, and fifth legs similar in form and proportion; fifth longer than preceding two, dactylus terminating in hair-like structure. Pleopods long and feathery. Sixth abdominal somite narrow, width two times in length. Telson (Plate 1, fig. 11) tapering, without spines on dorsal side, terminal border with two spines of equal length, in between with a pair of setae.

*Type locality* Aparri, Cagayan Province, Luzon. Specimens were caught in banuwar drag net.

Live specimens transparent yellowish, with pink eyes in female. Preserved specimens in alcohol, yellowish.

Several male and female specimens collected from Aparri, Cagayan, September 10, 1937, range from 11 mm to 80 mm from tip of rostrum to tip of telson.

*Palaeomon mazonensis* can be distinguished from other known described species of *Palaeomon* by the character of its thin upwardly curved rostrum, its slight laterally compressed body, its

tapering telson without dorsal spines, and the character of its weak third, fourth, and fifth walking legs. Males and females similar. Morphological dimorphism apparently lacking.

## REFERENCES

- BLANCO, G. J. The Atyidae of the Philippines. *Philip. Journ. Sci.* 56 (1935) 29-39, pls. 1-2.
- BLANCO, G. J., and FIDAL, J. ABRIOLA. Five species of Philippine shrimps of the genus *Palaemon*. *Philip. Journ. Sci.* 44 (1937) 219-221, pls. 1-3.
- COWLES, R. P. Palaemon of the Philippine islands. *Philip. Journ. Sci.* 5 D 2 (1914) 317-403, pls. 1-3.
- ESTAMPADOR, E. P. A check list of Philippine crustacean decapods. *Philip. Journ. Sci.* 62 (1937) 488, 489.
- KEMP, ST. Fauna of the Inlet Lake (Crustacea Decapoda) of the Inlet Lake basin. *Rev. Ind. Mus.* 14 (1918) 81-102, pls. 24, 25.
- KATHLEEN, M. J. The Brachyura and Macrura of Porto Rico. *Bul. U. S. Fish Comm.* 20 (1902).
- KATHLEEN, M. J. Decapod Crustacea of the northwest coast of North America. *Hartmann, Alaska Expedition* (1904).

## ILLUSTRATION

[Drawn by the author.]

### PLATE I *PAISON LUTONENSIS* SP. NOV.

1, Male, lateral view,  $\times 4$ ; 2, eye lateral view,  $\times 60$ ; 3, antennule with portion of flagella ventral view  $\times 60$ ; 4, antennal scale,  $\times 60$ ; 5, mandible with palp,  $\times 60$ ; 6, maxillule,  $\times 60$ ; 7, maxilla,  $\times 60$ ; 8, terminal joint of third maxilliped,  $\times 60$ ; 9, chela of first peropod,  $\times 100$ ; 10, chela of second peropod,  $\times 60$ ; 11, apex of telson,  $\times 100$

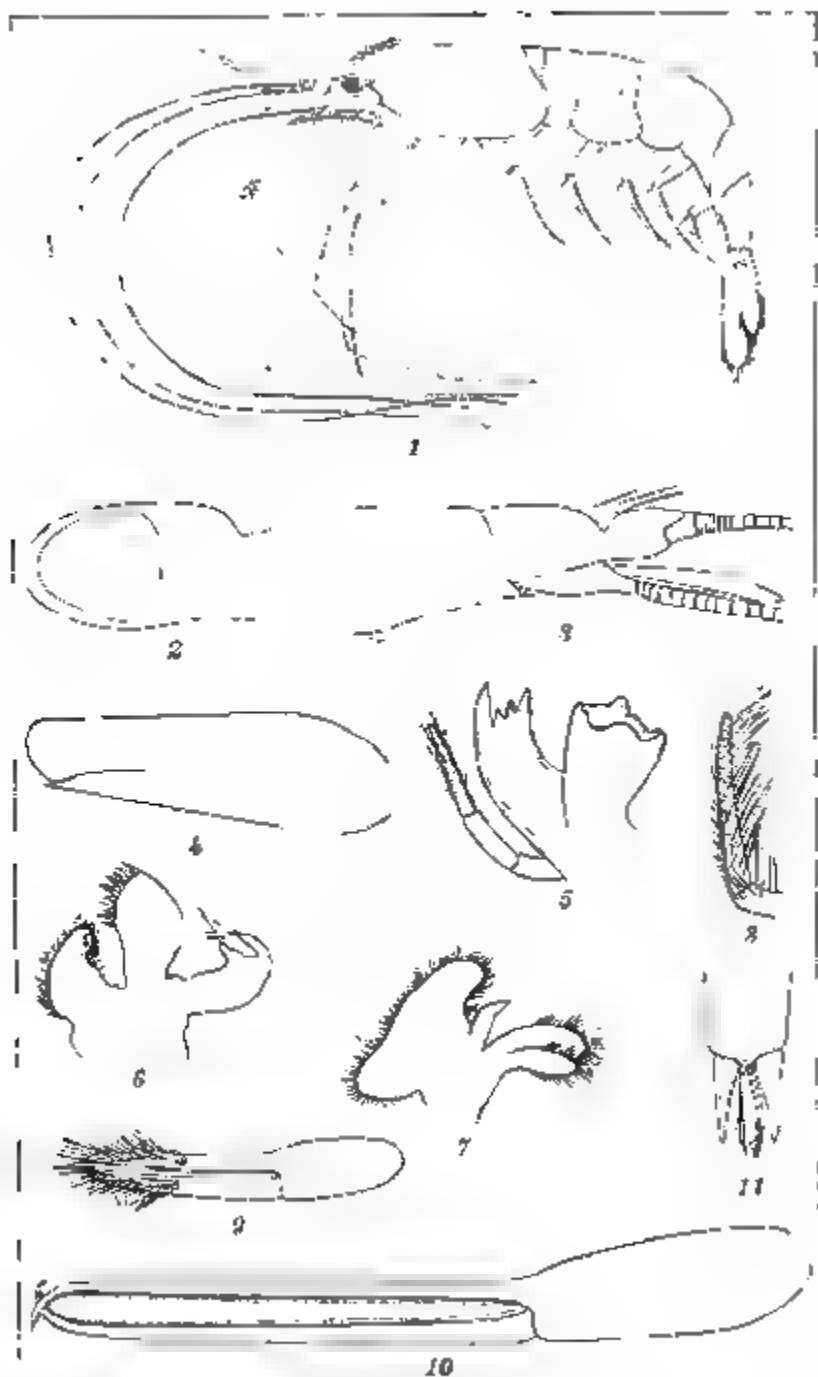


PLATE 1. PALÆMON LUZONENSIS SP. NOV.

## A REVIEW OF PHILIPPINE HOLOCENTRIDÆ

By JOSE R. MONTILLA

*Of the Fish and Game Administration, Bureau of Science, Manila*

### FIVE PLATES

This paper contains a review of species of the family Holocentridæ known to inhabit Philippine waters. The material used is in the collection of the Fish and Game Administration, Bureau of Science, Manila.

The soldier fishes (Holocentridæ) are shore fishes generally inhabiting rocky banks in tropical seas. They are active, carnivorous, and quarrelsome fishes, and take the hook readily. Hence they are considered game fishes.

The flesh of the Holocentridæ is firm; their scales are very hard, large and with very rough edges. Their coloration is almost always brilliant, characteristic of fishes of coral reefs. These fish are caught in large numbers and are valued as food.

Body oblong, or rather elevated and compressed. Head moderate; eye large, lateral; mouth moderate, cleft more or less oblique, extending to the sides of the muzzle, both jaws, vomer, palatines, and sometimes ectopterygoia with bands of small teeth; bones of head grooved or with strong ridges, ending in short or long spines and forming a posterior serration, especially in opercular series. Dorsal with ten to eleven spines, anal four, third usually very long; ventrals thoracic, with a spine and 5 to 8 soft rays; caudal forked. Scales moderate, ctenoid, very strong, absent on head. Pyloric appendages numerous or moderate in number.

#### *Key to the Philippine genera of the Holocentridæ*

- |   |                      |
|---|----------------------|
| α <sup>1</sup> A long spine at edge of preoperculum ... | <i>Holocentrus</i> . |
| α <sup>2</sup> No long spine at edge of preoperculum    | <i>Myripristis</i> . |

#### Genus HOLOCENTRUS *Günther, 1763*

Oblong or more or less elongate, compressed, back more or less arched. Branchiostegals eight. Eyes large. Mouth moderate. Jaws of equal length, or lower slightly longer; snout of moderate length. Bands of small teeth on premaxillaries, vomer,

palatines, ectopterygoids, and lower jaw. Opercles and sub-orbitals serrated; opercle with two spines, generally a large spine at angle of preopercle. Posterior and inferior border of preoperculum, operculum, and suboperculum with a row of parallel spines, less developed on interoperculum. Orbitals serrated. Preorbital with a row of generally large spines along its lower border and often similar spines along a median ridge. Dorsal beginning a short distance behind head separated by a deep notch into a longer anterior spiny part and a shorter posterior soft part. Dorsal spines commonly eleven, strong, depressible in a groove; anal opposite to soft dorsal with four spines, third longest, enormously developed, provided at its back with a groove to fit last, slenderer, and shorter spine, caudal forked; pectorals with a weak short spine. Ventral fins with a slender spine and seven soft rays. Scales ctenoid, of moderate size. No scales on skull, which is provided with convergent bony ridges. Lateral line continuous. Pyloric appendages numerous. In life always brilliant red with lines or stripes of black, white, or golden. Fins often with black and white markings.

*Habitat*.—Tropical seas. On rocky banks near the shore.

*Key to the Philippine species of Holocentrus.*

- a' Last dorsal spine longer than penultimate. Lower jaw more prominent.
  - b. Membrane of spinous dorsal never black, sometimes a black spot between first spines. Anal IV 7 to 8. .... *H. sumneri*.
  - b'. Membrane of spinous dorsal black with a white band. Anal IV 8 to 10. .... *H. opercularis*.
- a' Last dorsal spine shortest. Jaws equal or upper jaw slightly prominent.
  - b. Two and a half rows of scales between spinous dorsal and lateral line.
    - c. Membrane of spinous dorsal blackish crossed by a white band. .... *H. diadema*.
    - c'. Membrane of spinous dorsal not black or without crossed band.
      - d'. Lateral line 50 or 51. Nasalia not rounded. A silvery patch below posterior part of spinous dorsal. .... *H. Werkeri*.
      - d". Nasalia rounded in front. Eight or more rows of scales on preoperculum.
        - e'. Lateral line 42 to 44. Nasalia rounded in front, without spines. .... *H. laetes-guttatus*.
        - e". Nasalia ending with denticled spines. Lateral line 33 to 41.
          - f'. Snout much shorter than eye. No silvery patch on superior part of caudal peduncle.
            - g'. Nasal opening without spines. .... *H. ruber*.
            - g". Nasal opening with spines. .... *H. cornutus*.
          - f". Snout more pointed, equal to eye or nearly equal. Often times a silvery patch on superior part of caudal peduncle. Nasal opening with spines.

- ♂<sup>1</sup> Lateral line 34 to 37. Membrane of spinous dorsal scarcely incised. *H. violaceus*.  
 ♀<sup>2</sup> Lateral line 41. Membrane of spinous dorsal incised. *H. caudimaculatus*.  
 ♂<sup>3</sup> Four rows of scales between spinous dorsal and lateral line. Lateral line 43 or 44. *H. spargifer*.

**MOLINENTRUS SAMMARA (Forsk.)** Plate I, fig. 1

- Sciaenops sammara* FORSKÄL, *Descript. Anim.* (1775) 48, 49.  
*Labrus angulosus* LACÉPÈDE, *Hist. Nat. Poiss.* 1 (1802) 430.  
*Holocentrus sammara* RUFFELL, *Atl. Reise N. Afrika* (1826-1831) 35.  
*Holocentrus sammara* CUVIER and VALENCIENNES, *Hist. Nat. Poiss.* 3 (1829) 316; BLEEKER, *Journ. Ind. Arch.* 2 (1848) 626; *Nat. Tijdschr. Ned. Ind.* 3 (1852) 355 GÜNTHER, *Cat. Fish. Brit. Mus.* 1 (1859) 16; BLEEKER, *Ned. Tijdschr. Dierk.* 4 (1873) 213, GÜNTHER, *Smaller Fishes* 1 (1873-1875) 140, *Day Fishes of India* 4\* (1878-1885) 173, SAUVAGE, *Poiss. Madagascar*, (1891) 31, WILSON and DE BEAUFORT, *Fish. Indo-Austr. Arch.* 5 (1923) 233-235.  
*Holocentrus sammara* JORDAN and SEALE, *Bull. U. S. Bur. Fish.* 25 [(1905, 1906) 22].  
*Holocentrus fasciatus* SEALE, *Occ. Papers B. P. Bishop Mus. Hawaii*, 1 (1901) 63.  
*Holocentrus microstomus* FOWLER, *Proc. Acad. Nat. Sci. Phila.* 53 pt. 2 (1901) 325 (nec. Günther).  
*Flammeo sammara* JENKINS, *Bull. U. S. Fish. Comm.* 22 [(1902) 1904] 410 JORDAN and EVERMANN, *Bull. U. S. Fish. Comm.* 23 [(1906) 1905] 153.

Dorsal X, I, 12; anal IV, 8, pectoral 14; ventral I, 7; lateral line 40 to 42, transverse line 12.

Elongate, dorsal profile sloping down in a gently curved line from dorsal to snout. Height of body 3 to 3.3, head 2.7 to 3 eye 2.5 to 3 in head; snout 3.5 to 4 in head. In young, eye slightly less than snout. Interorbital space 1.3 to 1.5 of eye. Maxillary reaching or not reaching to below anterior half of eye, nasal opening rounded or obtusely pointed in front without spine; lower jaw prominent. Nasal opening without spines; teeth villiform. Preorbital with a row of subequal numerous spines, postorbital narrow, serrated along hind border; limbs of preopercle serrated in entire extent, length of preopercular spine equal to about one third diameter of eye. External edges of all opercles more or less serrated, opercle with two spines, upper as large as preopercular, lower rather smaller. Preorbital denticulation strong, suborbital serrated. Predorsal scales 6 or 7. Second and third dorsal spines longest, about equal to fourth spine but shorter than snout and eye together. After fourth spine preceding spines decreasing in size, second to last shortest, last dorsal spine slightly longer than preceding spine about equal to half diameter of eye, second dorsal highest an-



teriorly, rather higher than highest dorsal spine. Pectoral nearly equal to head excluding snout. Ventrals and pectorals subequal, as long as eye and snout. Ventral spine somewhat longer than postorbital part of head, reaching halfway to the anal. Least height of caudal peduncle 1.1 to 2.2 in its length. Caudal forked, lobes rounded. Third anal spine strongest and longest, equalling from 1.5 to 4 in length. Scales six to seven rows between occiput and base of dorsal fin, seven along preopercle.

Body with or without longitudinal violet bands, which may be composed of spots. Black spot may be present on either cheek. Usually a black spot between first four dorsal spines, sometimes a light mark at bases and at tips of first ten spines. Anterior edge of soft dorsal and anal, also usually upper and lower edge of caudal, violet.

*Distribution*.—Red Sea, east coast of Africa, seas of India to Malay Archipelago and beyond.

The above description is based on specimen No. 12212, 113 mm, collected from Tambo, Anau Island, Mindoro Province, August 30, 1925.

Luzon, Ilocos Norte Province, Burgos, No. 14773, 67 mm, October 29, 1936. Manila, No. 27421, 142 mm, 1911. Mindoro, Mindoro Province, Puerto Galera, No. 7195, 131 mm, 1912, Tambo Anau Island, No. 12212, 113 mm, August 30, 1925. PALAWAN, Palawan Province, Carigara, No. 12612, 81 mm, No. 27426, 35 mm, November 7, 1925. MINDANAO, Sulu Province, Banga, No. 11504, 121 mm, No. 27420, 125 mm, August 27, 1924; No. 13652, 117 mm, No. 27428, 104 mm, No. 27430, 120 mm, No. 27429, 121 mm, No. 15356, 134 mm, No. 12612, 97 mm, April 15, 1926, No. 11109, 102 mm, June 18, 1921; Lubigan Island, No. 27427, 153 mm, No. 15512, 151 mm, January to March, 1925; Sitangkai, No. 16353, 48 mm, June 17, 1921; Zamboanga Province, No. 27422, 144 mm, No. 15099, 136 mm, May, 1921.

GUAM, No. 7081, 42 mm, No. 7082, 45 mm.

**Holocentrus opercularis** Cuv. & Val. Plate 1, fig. 2.

*Holocentrus opercularis* CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 357. QUoy and GAIMARD, Voy. Astro., Poiss. 3 (1834) 640; BLEEKER, Nat. Tijdschr. Ned. Ind. 2 (1851) 233. Ned. Tijdschr. Dierk. 4 (1873) 211; GASTRICH, Cat. Brit. Mus. 1 (1859) 47, *Fische der Südsee* 1 (1873-1879) 100, pl. 66, fig. a; SEALE, Occ. Papers R. P. Bishop Mus. Hawaii 1 (1901) 65, WEEBER and DE BEAUFORT, Fish. Indo-Aust. Arch. (1929) 232-234.

*Holocentrus opercularis* JORDAN and SEALE, Bull. U. S. Bur. Fish. 23 [(1905) 1903] 227.

Dorsal X, 1, 13; anal IV, 9, pectoral 14; ventral 1.7, lateral line 38 to 40; transverse line 12.

Body elongate, dorsal profile practically straight from dorsal spine to snout. Height 3.5 in length without caudal. Head 2.9 in length. Eye 3.3, about equal snout. Maxillary reaching to below middle half of eye. Nasal opening round, without spines. Lower jaw more prominent. Lower border of pre-orbital with spines, directed backwards. Postorbital bone narrow, serrated. All parts of opercular and preopercular bone serrated along posterior borders. Operculum with two spines, upper spine longest. Preopercular spine broad and long, not reaching to gill opening. Seven transverse rows of scales on preoperculum. Origin of dorsal separated by 7 scales from occiput. Fourth dorsal spine longest, second, third, and fifth of practically same length, tenth spine shorter than eleventh, which is shorter than half diameter of eye. Membrane between spines incised. First anal spine small, third broad, strong and long, almost equal to head without snout, with a deep furrow behind to fit fourth spine, which is slender and equal to postorbital part of head. Ventrals and pectorals equal to head without snout. Length of caudal equal, 5.6 long.

Preserved specimen in alcohol silvery, each scale brownish with a silvery border. Fins yellowish pink. Membrane of spinous dorsal black, with sawlike subbasal longitudinal band and a white upper margin, biggest immediately behind each spine.

*Distribution*.—Tahiti, New Ireland, Samoa, Guam, Philippine Islands.

The above description is based on specimen No. 721, 160 mm., collected from Puerto Galera, Mindoro Province.

MINDORO, Mindoro Province, Puerto Galera, No. 7228, 170 mm., March, 1912.

*Holocentrus lacteoclitaeus* (C. V.) M. Weber. *Plac.* 1, 57, 2.

*Holocentrum lacteo-guttatum* Cuvier and Valenciennes, *Hist. Nat. Poiss.* 3 (1829) 169, WEBER, *Fische S. born Exped.* (1913) 183; WEBER and DE BEAUFORT, *Fish. Indo-Austr. Arch.* 8 (1920) 238-242.

*Holocentrum argenteum* Cuvier and Valenciennes, *Hist. Nat. Poiss.* 7 (1831) 371, QUoy and GOMARA, *Voy. Astral. Poiss.* 3 (1834) 677.

*Holocentrum punctatus* max. BECKER, *Nat. Tijds. Ned. Ind.* 4 (1853) 218, *Ned. Tijds. Dierk.* 4 (1873) 213, JORDAN and EVERMANN, *Bull. U. S. Fish. Comm.* 23 [(1903) 1905] 162; JORDAN and SEALE, *Bull. U. S. Bur. Fish.* 28 [(1905) 1906] 221.

*Holocentrum diplocephalus* GÜNTHER, *Fische der Südsee* 1 (1873-1876) 87.

*Holocentrus gladiispinus* FOWLER, Proc Acad Nat Sci Phila 56 (1904) 225.

*Holocentrus lactoguttatus* JORDAN and SEALE Bull U S Bur Fish 25 [(1905) 1906] 225 JORDAN and RICHARDSON Bull U S Bur Fish (1908) 242

Dorsal XI, 13, anal IV, 9; pectoral 15, ventral 17, lateral line 44; transverse line 12.

Body oblong. Height of body 2.9 to 3 in length without caudal. Head 3 in length, compressed, upper profile more convex than lower; snout 1.75 to eye, snout, convex, upper jaw projecting a little; eye large, 2.5 to 2.8 in head; interorbital space 1.4 to eye. Mouth rather small, max. lary small, slipping below narrow preorbital, teeth minute, pointed, in band in jaws, on palatines, and a small patch on vomer. Nostrils close to front rim of orbit, anterior inconspicuous but posterior part with large cavity. Interorbital space broad, slightly concave medially. Lower border of preorbital with a strong spine anteriorly, directed backwards and followed by a series of smaller spines. Postorbital bone narrow, serrated. Preopercle armed below at its angle with a broad daggerlike spine equal to half diameter of eye. Two superior spines of operculum enlarged, equal to or shorter than preopercular spine. Gill opening extending forward opposite middle of orbit.

Scales somewhat small, imbricated. Scales at base of spinous dorsal forming a sheath, each scale ending in a backwardly directed spine. Two and a half rows of scales between spinous dorsal and lateral line. Eight transverse rows of scales on preoperculum. Origin of dorsal separated by 8 scales from occiput. Spinous dorsal inserted over origin of pectoral, fourth spine longest, next two nearly subequal. First spine about equal ninth, eleventh shortest, equal to half eye. Membrane between dorsal spines deeply incised. First anal spine very small, third longest, as long as pectoral. Pectoral rather long, equal to head without snout slender, upper rays longest. Ventral spine slender, a little over two-thirds length of fin. Least height of caudal peduncle 1.6 in its length.

Specimen in alcohol faded brassy brown, with more or less developed lighter longitudinal bands, corresponding with rows of scales. Above lateral line through longitudinal pale whitish bands along each series of scales. Below, seven bands, those just below lateral line broadest. Spinous dorsal with a small white blotch behind each spine.

**Distribution.** Java, Celebes, Ceram, New Guinea, Philippines. The above description is based on specimen No. 12339, 88 mm, September 22, 1925. Collected from Salat point, Catanduanes, Albay, the only specimen in our collection.

GUAM, No. 10993, 87 mm, August, 1912.

**HOLOCENTRUS RUBER (FOWLER)** Plate I, fig. 1.

*Scorpa rubra* FOWLER, Descript. Anim. (1975) 46

*Perca rubra* BLOCH, Schneider, Syst. Ichth. (1801) 90.

*Holocentrus orientalis* CUVIER and VALENCIENNES, Hist. Nat. Poiss. 3 (1829) 147-150

*Holocentrum marginatum* CUVIER and VALENCIENNES, Hist. Nat. Poiss. 3 (1829) 161.

*Holocentrum laticeps* CUVIER and VALENCIENNES, Hist. Nat. Poiss. 3 (1829) 157; 7 (1831) 376.

*Holocentrum rubrum* GÜNTHER, Cat. Brit. Mus. 1 (1859) 35, PLAYFAIR, Fish. Zanzibar (1866) 32, BLEEKER, Ned. Tijdschr. Dierk. 4 (1873) 224, GÜNTHER, Fisch. der Südsee 1 (1873-1875) 96, DAN. Fishes of India 4\* (1878-1888) 172, MACLEAY Deser. Cat. Austr. Fish. 1 (1881) 149; SAUVAGE, Poiss. Madagascar (1891) 35; WILMER and DE BEAUFORT, Fish. Indo-Austr. Arch. 5 (1899) 244-246.

*Holocentrus alboruber* JORDAN and FOWLER, Proc. U. S. Nat. Mus. 26 (1902) 15.

*Holocentrus albo-ruber* FOWLER, Proc. Acad. Nat. Sci. Phila. 50 (1904) 235.

*Holocentrus prasinus* JORDAN & SEALE, Bull. U. S. Bur. Fish. 25 (1905) 1906] 226, JORDAN and STARKS, Proc. U. S. Nat. Mus. 32 (1907) 494.

*Holocentrus ruber* JORDAN and SEALE, Proc. Day Acad. Sci. 10 (1905) 1907] 5; JORDAN and RICHARDSON, Bull. U. S. Bur. Fish. (1908) 248, JORDAN and STARKS, Ann. Carnegie Mus. 11 (1917) 447; FOWLER and BEAN, Proc. U. S. Nat. Mus. 62 (1922) 18.

Dorsal XI, 12 to 13, anal IV, 9 or 10, pectoral 14; ventral 1, 7; lateral line 33 to 36; transverse line 9 to 9.5.

Body oblong; head blunt, its upper profile curved and rather abruptly descending from occiput to snout; height of body 2.5 to 2.9. Head 2.8 to 3; eye large, 2.5 to 2.6 in head, interspace between eyes one-fifth length of head and about twice as long as snout; jaws nearly equal, upper jaw scarcely projecting; bony ridges bordering groove, maxillary reaching not quite to below middle of eye; nasal opening without spines. Lower border of preorbital with a series of irregular blunt spines; preorbital ridge with smaller spines directed outwards, first somewhat longer. Operculum with two strong prominent spines, upper longer and stronger than lower. Preopercular spine less than eye. Preoperculum with six or seven rows of scales, about

six between occipital and dorsal. Third and fourth dorsal spines longest, last shortest, soft dorsal fin rather higher than spinous dorsal. Membrane between dorsal spines rather deeply incised. Third anal spine as long as head without snout; ventrals longer than pectorals, ventral spine equal to snout and eye, rather longer than pectorals. Least height of caudal peduncle, 1.3 to 1.5 in its length. Scales scarcely striated.

Red, with eight whitish longitudinal bands, outer edges of caudal blackish; ventrals whitish. Upper part of membrane between dorsal spines blackish, as well as that between third and fourth anal spines and first soft ray. A longitudinal darkish streak on edge of ventral rays and on upper and lower lobe of cauda.

*Distribution*.—East coast of Africa, Red Sea, coasts of India and Ceylon, to the Philippines and Japan, north and west coasts of Australia, eastward to Samoa.

The above description is based on specimen No. 1753, 125 mm collected from Cagayan, Oriental Misamis Province, Mindanao September 12, 1907.

LUZON, Pangasinan Province, Alaminos, No. 9673, 115 mm, 1921; Zambales Province, Iba, No. 9740, 143 mm, December, 1921; Cavite Province, Monja Island, No. 9767, 105 mm, April 23, 1922; Batangas Province, Nasugba, Barrio Papaya, No. 13292, 155 mm, January 13, 1926; Tayas Province, Palio, No. 16036, 145 mm, March 23, 1928. MINDORO, Mindoro Province, Calapan, No. 9353, 115 mm, January, 1923. PALAWAN, Palawan Province, Cudat, No. 10276, 145 mm, No. 27420, 136 mm, October 1, 1922. PANAY, Antique Province, Guimaras, No. 9924, 172 mm, June 4, 1922. CEBU, Cebu Province, Cebu, No. 9410, 82 mm, December, 1908. MINDANAO, No. 4308, 178 mm, June 3, 1908. Oriental Misamis Province, Cagayan, No. 1573, 125 mm, September 12, 1907; Zamboanga Province, Zamboanga, No. 2311, 130 mm, April 8, 1908; Sulu Province, Jolo market, No. 10268, 150 mm, January 20, 1930.

HONGKONG, No. 6459, 120 mm. No. 6396, 107 mm, August, 1910.

*DOLOCENTRUS CORNUTUS* Bleeker. Plate 2, fig. 2.

*Holocentrus cornutus* BLEEKER, Not. Tijdschr. Ned. Ind. 5 (1853) 240; Ned. Tijdschr. Dierk. 4 (1873) 222; WILSON, *Fische Siboga-Exped.* (1913) 182; WILSON and DE BEAUFORT, *Fish Indo-Austr. Arch.* 5 (1923) 243, 244.

*Holocentrus melanospilus* BIZZAZZI, *Negonde bijdrage Visch-fauna van Amboina*, Act. Soc. Scient. Indu-Néerl., 3 (1858) 2.

*Holocentrus melanospilus* BLANCK, *Ned. Tijds. Dierk.*, 4 (1873) 226.

*Holocentrus cornutus* EISENHANN and SEALE, *Bull. U. S. Bur. Fish.* 24 (1903) 60.

Dorsal XI, 13, anal IV, 9, pectorals 12 or 13; ventral I, 7, lateral line 33 to 36; transverse line 10.

Body oblong, head blunt, its upper profile curved and rather abruptly descending from occiput to snout. Depth 2.8 to 3 in length. Head 3, eye large, 2.3 to 2.6 in head, about double length of snout, interorbital space about 1.5 in eye, jaws equal in front, maxillary reaching to below middle of eye; anterior nasal end and posterior part of nasal opening spiny. Lower border of preorbital with a series of irregular blunt spines, preorbital ridge with a large blunt spine in front. Opercular bones strongly denticulated. Two strong spines in upper part of operculum, upper longer and stronger than lower. Preopercular spine about equal eye. Preoperculum with six to seven transverse rows of scales, 6 or 7 scales between occiput and dorsal. Third and fourth dorsal spine longest, last shortest. Membrane between dorsal spines somewhat deeply incised. Third anal spine about length of head without snout; pectorals shorter than ventrals; ventral about equal head without snout. Ventral spine less than snout and eye. Least height of caudal peduncle 1.8 to 2 in its length. Scales firm, large, strongly ctenoid.

Alcoholic specimens light or dark brown, with longitudinal silvery bands along rows of scales; a dark blotch at base of caudal and on soft dorsal and anal present or absent; membranes between dorsal spines partly blackish, as also that between second and third anal spines and first soft ray of anal. Outer margin of caudal dark.

The above description is based on specimen No. 14067, 118 mm, collected from Sibutu Island, Sulu Province April 27, 1927.

LUZON, Sorsogon Province, Bulan, No. 3028, 122 mm, 1904. MINDORO Mindoro Province, Caapian, No. 19311, 133 mm, January, 1924; No. 11192, 132 mm 1926; Puerto Galera, No. 7194, 117 mm, No. 7210, 115 mm, 1912. ROMBLON, Romblon Province, Romblon, No. 10469, 129 mm, August 1, 1921. NEGROS, Negros Oriental Province, Siquijor Island, No. 13484, 170 mm, March 10, 1926. CEBU, Cebu Province, Bantayan Island, No. 5741, 128 mm, May 1909. MINDANAO, Davao Province, Ti-

funod River, No. 10700, 102 mm, May 28, 1921; Sulu Province, Lumbian Island, November 10, 1927, Sibutu Island, No. 27417, 66 mm, No. 27418, 118 mm, April 27, 1926. Sulu, Lapak, No. 15657, 88 mm, No. 27414, 94 mm, November 8, 1927; Bungao Island, No. 11364, 118 mm, July 15, 1921; Sitankai, No. 10696, 98 mm, No. 27413, 102 mm, June 17, 1921.

*HOLOCENTRUS VIOLACEUS* Bleeker. *Atlas* 2, fig. 3

*Holocentrus violaceum* BLEEKER. *Nat. Tijdschr. Ned. Ind.* 5 (1873) 335, GÜNTHER, *Cat. Brit. Mus.* 1 (1859) 43; BLEEKER. *Ned. Tijdschr. Dierk.* 4 (1873) 221.

*Holocentrus violaceus* JORDAN and SEALE. *Bull. U. S. Bur. Fish.* 23 [(1905-1906)] 223.

Dorsal XI, 14 or 15; anal IV, 9, pectoral 13, ventral I, 7; lateral line 34 to 38; transverse line 10.5

Body oblong, dorsal profile sloping in a gentle convex curve to snout; height 2.5 to 2.6. Head 2.6 to 3. Eye 3.3; length of snout not much less than diameter of eye; jaws nearly equal in front; maxillary reaching to below anterior half of eye; nasal opening at anterior part with spines, posterior part with 3 spines. Preorbital with a large spine in front, directed downwards, followed by several smaller spines pointing in same direction. Postorbital serrated along its hind border. Opercular bones strongly serrated with two flat spines, lower spine smaller. Preopercular spine long, slender, about equal to diameter of eyes. Preoperculum with seven transverse rows of scales, seven scales between occiput and origin of dorsal. Third, fourth, and fifth dorsal spines longest, last shortest, first anal spine small, third longest, about 1.75 of head; ventrals practically equal to pectorals, which are equal to head without snout; ventral spine longer than eye equal to part of head without snout and eye. Least height of caudal peduncle 1.3 to 1.5 in its length.

Alcohol specimens dark purplish brown, each scale with a broad silvery subterminal longitudinal band; upper end of operculum with a black blotch, upper side of caudal peduncle with a silvery patch immediately behind dorsal. Fins hyaline, spinous dorsal dusky.

*Distribution*.—New Guinea, North Australia, Fiji Islands, Samoa, Philippines.

The above description is based on specimen No. 7175, 134 mm, collected from Puerto Galera, Mindoro Province, March to May, 1912.

MINDORO, Mindoro Province, Puerto Galera, No. 7206, 165 mm, March to May, 1912. MINDANAO, Davao Province, Samal

Island, No. 3884, 117 mm, May 2, 1908. PANAY, Iloilo Province  
Iloilo, No. 14432, 172 mm. June or July, 1923.

*HOLOCENTRUS CAUDIMACULATUS* Bleeker, Plate 2, fig. 1.

*Holocentrus spangler* RÜPPELL, Atlas Reise Nordl. Afrika, Fische  
(1828) 86, pl. 23, fig. 1.

*Holocentrum spanglerum* CUVIER and VALENCIENNES Hist. Nat. Poiss.  
3 (1829) 206; 7 (1831) 247.

*Holocentrum caudimaculatum* RÜPPELL, Atlas Reise Nordl. Afrika,  
Fische (1828) 97, GÜNTHER, Cat. Brit. Mus. 1 (1859) 41 KNER,  
Fische Novara Exped. (1855-1867) 8 PLAYFAIR, Proc. Zool. Soc.  
London (1867) 855; BLEEKER, Ned. Tijdschr. Dierk., 4 (1873) 210  
GÜNTHER, Fische der S. See 1 (1873-1875) 96 DAY, Fishes of In-  
dia 4 (1878-1888) 172; WEBER and DE BEAUFORT Fish. Indo-  
Austr. Arch. 3 (1929) 247-249.

*Holocentrus caudimaculatus* JORDAN and SEALE, Bull. U. S. Bur. Fish.  
25 [1906 (1908)] 223.

Dorsal XI, 14, anal IV, 9, pectoral 14, ventral 1.7; lateral  
line 41 or 42; transverse line 12

Body oblong dorsal profile slightly arched, height 2.5. Head  
2.6 to 2.8; eyes 8, longer than snout, interorbital space 1.75 in  
diameter of eye, maxillary reaching to below middle of eye.  
bony ridges bordering groove for peduncle of premaxillaries  
ending in a blunt bifid spine in front, front margin of nasal  
opening with one or more spines in old specimens, jaws equal  
Preorbital serrated, anteriorly with a large blunt spine pointing  
downward and followed by small spines directed backward  
Postorbital serrated. Opercular bones serrated, upper opercular  
spine longest, preopercular spine as long as or longer than  
orbit Preoperculum with seven transverse rows of scales  
Shoulder bone serrated. Intranasal spines 2. Eight scales  
between occiput and base of dorsal. Teeth villiform. Fourth  
dorsal spine longest, equal to about 2.3 of height of body, but  
shorter than soft dorsal. Dorsal interspinous membrane rather  
deeply emarginate. Third anal spine longest and strongest  
longer than fourth dorsal spine and equaling about 1.8 of height  
of body; ventrals about equal to pectorals, ventral spine about  
equal to fourth dorsal spine, shorter than eye and snout. Least  
height of caudal peduncle 1.5 in its length. Caudal forked.

Preserved specimens in alcohol brownish, a conspicuous sil-  
very patch on upper part of free portion of tail just behind  
end of soft dorsal fin; a reddish brown band along base of dorsal  
and anal.

*Distribution*—Red Sea, Seas of India and the Malay Archip-  
elago



The above description is based on specimen No 12152, 131 mm, collected from North Ibinu, Sulu Province.

MINDANAO, Sulu Province, Jolo Island, No. 2051, 132 mm, February, 1908. Lunlilan Island, No 15694 150 mm November 10, 1927

*HOLOCENTRUS DIADEMA* Lacépède. *Fish. 3*, 412.

*Holocentrus diadema* LACÉPÈDE, *Ann. Nat. Poiss.* 5 (1803) 371, RUFFELL, *Atlas Poiss. N. Afr. N.*, *Fische* (1826) 1831, 31, 32, 33, 34 and VALENTINUS *Hist. Nat. Poiss.* 3 (1828) 213. *Bull. Soc. Nat. Tijdschr. Ned. Ind.* 3 (1852) 209, GÜNTHER, *Cat. Brit. Mus.* 1 (1859) 42, *Fische der Südpaz.* 1 (1873-1875) 97; DAY, *Fishes of India* 4\* (1878-1889) 171; SAUVAGE, *Poiss. Malesias* (1901) 21, SEALE, *Oce. Papers B. P. Bishop Mus. Hawaii* 1 (1901) 68. JORDAN and EVERMANN, *Bull. U. S. Fish. Comm.* 23 [1903] 196, 150; WEBER, *Southern Exp. Fische* (1913) 180, WILDER and DE BLANCHET, *Fish. Indo-Austr. Arch.* 5 (1929) 235-240.

Dorsal XI, 13 or 14; anal IV, 9; pectoral 13, ventral I, 7, lateral line 43 to 48; transverse line 12.

Body oblong, dorsal profile from snout to dorsal with slight curve; height of body 2.2 to 2.5. Head 3 to 3.4; eye 2.6 to 2.8, about 1.5 of snout, interorbital space 1.5 of eye; maxilla reaching to below anterior third of orbit. Opercles, preorbital, and suborbitals denticulated, as is also posterior half of upper edge of orbit. Lower edge of preorbital serrated and with a strong blunt spinate projection directed downwards and forwards. Operculum with two prominent spines, upper spine stronger, nearly equal in size to preoperculum. Preopercular spine stout, equal to snout. Preoperculum with eight transverse series of scales, 7 or 8 scales between origin of dorsal and occiput. Fourth to sixth dorsal spines longest, equal to about half height of body, interspinous membrane deeply cleft, two dorsal fins about same height. Third anal spine as long as head without snout; ventral longer than pectorals, longer than head without snout, ventral spine about equal to snout and eye. Least height of caudal peduncle 1.5 in its length.

Preserved specimens in alcohol reddish, with ten white bands along body, corresponding to longitudinal rows of scales. Membrane of spinous dorsal black; crossed by a white band from lower portion of first dorsal spine to sixth and by a similar band near upper margin from sixth to last dorsal spine. Membrane between third and fourth anal spines darkish.

The above description is based on specimen No 13624, 98 mm, collected from Rungau Island, Sulu Province, April 17, 1926.

CATANDUANES, Albay Province, Sialot Point, No. 17278, 110 mm, September 22, 1925. MINDANAO, Sulu Province, Lamoian Island, No. 15612, 120 mm. No. 17271, 122 mm, No. 17272, 113 mm, No. 17273, 108 mm, No. 17274, 108 mm, No. 17275, 114 mm, No. 17276, 105 mm, November 10, 1927; Siasi Island, No. 27412, 80 mm, No. 16375, 55 mm, June 21, 1921; Bangau Island, No. 13621, 97 mm, No. 17269, 76 mm, No. 17270, 67 mm, April 17, 1926. Lubian Island, No. 16098, 69 mm, November 10, 1927; Bato, Tawi-tawi Island, No. 13648, 103 mm, April 5, 1926.

*HOLOCENTRUS BLEEKERI* M. Weber. *Fische* 2, fig. 2.

*Holocentrum argenteum* BLEEKER, *Act. Soc. Sc. Ind. Neerl.* 111: 10. B. Javanc. V. 2, Maatsch. Amstama (1858) 1; *Ned. Tijdschr. Dierk.* 4 (1877) 203 (nec C. V.).

*Holocentrum bleekeri* WILMER, *Fische Siboga-Exp.* 65 (1913) 181. WILMER and DE BEAUFORT, *Fish Indo-Austr. Arch.* 8 (1929) 237, 238.

Dorsal XI, 13; anal IV, 9, pectoral 15; ventral I, 7, lateral line 40 or 51; transverse line 12.

Body oblong, dorsal profile ascending to about 22.5 degrees from snout to dorsal fin, thence descending nearly straight to end of spinous dorsal, height 3.3 to 3.5. Head 2.0 to 3 in length, eye large, diameter longer than snout; interorbital space 1.5 of eye, maxillary not reaching below middle of eye, nasal opening without spines; jaws equal. Lower border of preorbital with a series of irregular blunt spines, preorbital ridges with a large blunt spine in front and directed downward, followed by a few similar but much smaller spines. Postorbital finely serrated. Operculum strongly serrated along free border. Preopercular spine strong and moderately long, about one-half diameter of eye. Two enlarged spines on upper part of operculum. Preoperculum with eight transverse rows of scales, eight scales between occiput and dorsal. Fifth dorsal spine longest, about as long as eyes and snout together, last spine shortest. Membrane between dorsal spines deeply incised. First anal spine very small, third strongest and about as long as height of body, pectorals shorter than ventral; ventral spine equal to or more than half length of head. Least height of caudal peduncle 2 in its length.

Alcoholic specimens reddish brown with silvery longitudinal bands along rows of scales, silvery band above lateral lines with a brighter silvery path below posterior half of spinous dorsal. Fins yellowish.

*Distribution*.—New Guinea, Pacific Islands, Philippines.

The above descriptions based on specimen No. 16357 142 mm, collected from Manila

**Holocentrus spinifer (Forsk.)**. Plate 4, fig. 1.

*Sciaenops spinifer* FORSKAL, Descript. Anim. 1775, 42.

*Holocentrum* *ico* CUVIER and VALENCIENNES, Hist. Nat. Poiss. 3 (1829) 153-156, BRESLER, Nat. Tijdschr. Ned. Ind. 7 (1854) 153, SATO and POISS, Malacope, (1891) 28.

*Holocentrum spiniferum* GÜNTHER, Cat. Fish. Mus. 6 (1859) 30. KNOX, Fische Novara Exped. (1865-1867) 7, BRESLER, Nat. Tijdschr. Ned. Ind. 4 (1870) 205. GÜNTHER, Fische der Südsee 1 (1873-1875) 96, WEBER and DE BEAUFORT, Fish. Indo-Austr. Arch. 5 (1929) 270-237.

*Holocentrum andamanense* DAY, Proc. Zool. Soc. 1870, 686. F. S. S. of India 4 (1878-1886) 172.

*Holocentrus spinifer* FOWLER, Proc. Acad. Nat. Sci. Phila. 1893, 483. JORDAN and FERRAN, Bull. U. S. Fish. Comm. 23 (1903) 1906, 191, JORDAN and SEALE, Bull. U. S. Bur. Fish. 24 (1906) 1906, 223.

Dorsal, XI, 15; anal IV, 10, pectoral 15; ventral I, 7; lateral line 43 or 44, transverse line 14.

Body oblong, dorsal profile running in a straight line from dorsal to snout, with a hump at nape. Head, 2.6 in length, eye 2.6 in head, about same as snout; interorbital space narrow, twice in eye and 7.5 to 8 in head; maxillary reaching below anterior of eye, lower jaw more prominent, opening without spines. Preorbital with several slender spines. Preopercular spine large and stout, reaching to branchial opening. Preoperculum with seven transverse rows of scales. Operculum with four flat spines, two upper spines smaller; opercular spines followed by numerous smaller spines arranged in a parallel row. Origin of dorsal separated by about 9 scales from occiput. Second, third, and fourth dorsal spines longest, about same length as third anal spine; first and third spines slenderer than second and fourth; dorsal spines decreasing in size, last shortest, only one-third of eye. Soft dorsal fin about equal in height to spinous; first anal spine minute; third very stout, equal to eye and snout, with a deep furrow posteriorly to receive the fourth spine which is shorter and slenderer than third anal spine; ventrals about equal to pectorals which are equal to head without snout. Caudal forked, lobes pointed.

Rose-colored, with a deep-red spot behind eye, another deep-red spot above roof of pectoral, spinous dorsal deep red, other fins yellow.

**Distribution.**—Eastern coast of Africa through Indian Ocean to Pacific Ocean.

The above description is based on specimen No. 7107, 147 mm, collected from Puerto Galera, Mindoro Province, March to May, 1912. PALAWAN, Palawan Province, Cuyo Island, No. 1562b, 265 mm, June 18, 1927.

GUAM, No. 7085, 110 mm, September, 1911.

Genus MYRIPRISTIS Cuvier, 1829

Oblong, back more or less arched. Caudal peduncle slender, caudal forked. Eyes generally large. Mouth moderate. Lower jaw more prominent. Viliiform teeth in both jaws, on vomer and on palatine bones. Teeth of the outer series in upper jaw generally larger. Branchiostegals eight (exceptionally seven). Orbital and opercular bones serrated, operculum generally with a spine, preoperculum without spine. Dorsal beginning a short distance behind head, two dorsal fins scarcely united, first with ten to twelve spines, second with one spine and two or more soft rays. Dorsal spines depressible in a groove; ventrals with a long slender spine and seven rays, pectoral with a flexible spine and fourteen to sixteen soft rays. Caudal forked. Anal with four spines. Scales large, strongly ctenoid. No scales on skull. Lateral line continuous. In life generally bright red, with golden and silvery reflections or longitudinal bands.

**Distribution.**—Tropics, seas of both hemispheres.

Key to the Philippine species of *Myripristis*

- a Two patches of strong tubercular teeth on chin, two other patches on upper jaw. Lateral line 27 or 28. . . . . *M. melanostictus*.
- a' Two patches of tubercular teeth on chin and upper jaw not very prominent. Lateral line 28 to 40.
  - b<sup>1</sup> Lateral line 36 to 40. Snout 3 to 3.25 in eye; maxillary reaching below hind margin of pupil. . . . . *M. prafinus*
  - b<sup>2</sup> Lateral line 28 to 30. Snout 2.5 to 3 in eye.
    - c<sup>1</sup> Snout 2 to 2.5 in eye. About 3 round strong teeth on each side of upper jaw. . . . . *M. mundax*
    - c<sup>2</sup> Snout 2.5 to 3 in eye. Upper jaw with a few pointed teeth. . . . . *M. schultzei*.

MYRIPRISTIS MELANOSTICTUS Bleeker, Plate 4, Fig. 2.

*Myripristis hexagonus* BLEEKER, Nat. Tijdschr. Ned. Ind. 3 (1852) 262, Enum. Spec. Piscium (1859) 9 (nos. C. & V.).

*Myripristis melanostictus* BLEEKER, Ned. Tijdschr. Dierk. 1 (1853) 237, 4 (1873) 167, WEED and DE BEAUFORT, Fish. Indo-Austr. Arch. 6 (1929) 258, 259.

*Myripristis botche* KNER, Fische Novarra Exped. 1 (1865) 5, 6.

*Myripristis macrocephala* BLENNIUS, Ned. Tijdschr. Dierk., 4 (1873) 195;  
EISENHART and STABLE, Bull. U. S. Nat. Fish. 26 [(1906) 1907] 60;  
SMYTH, Proc. U. S. Nat. Mus. 42 (1912) 19a, WILSON, Fauna Si-  
ngapo-Knap. (1913) 180.

*Myripristis melanostigma* BLENNIUS, Atl. Ichth. 9 (1847) pl. 35, fig.  
3 (error).

Dorsal X, 14; anal IV, 12, pectoral I, 11, ventral I, 7, lateral  
line 27 or 28; transverse line 10.5

Height 2.2 to 2.4 Head 2.6 to 2.9. Eye 2.2 to 2.3. Inter-  
orbital space about one-half of eye, 1.5 to 3 in head; maxillary  
reaching to below posterior edge of pupil of eye. Lower border  
of posterior edge of maxillary with a series of rounded teeth,  
teeth in upper jaw enlarged and rounded at tip, the rest less  
pointed and more granular; a strong rounded tooth on each side  
of symphysis of lower jaw, and another strong rounded tooth  
on each side of chin, below the one mentioned, tongue without  
teeth. Dorsal separated by 8 or 9 scales from occiput, third  
and fourth dorsal spines longest, more or less equal to diameter of  
eye; fourth anal spine longest and shortest, pectoral and ven-  
tral spines about equal, shorter than head without snout, ven-  
tral spine longer than pectoral spine, equal to diameter of eye.  
Least height of caudal peduncle more than half of eye. Caudal  
deeply forked.

Alcoholic specimens yellowish brown with golden reflections  
and with more or less distinct silvery broad longitudinal bands  
on the body, corresponding to the rows of scales.

Alcoholic specimens reddish with golden or silvery reflections.  
Fins yellowish.

*Distribution*.—Celebes, Japan, Philippines. The above de-  
scription is based on specimen No. 1625, 115 mm, collected from  
Cagayan, Oriental Misamis Province, Mindanao, September 13,  
1907.

MINDORO, Mindoro Province, Calapan, No. 1012, 141 mm,  
August 27, 1907. MINDANAO, Oriental Misamis Province, Ca-  
gayan, No. 1368, 91 mm, No. 1570, 105 mm, No. 1640, 94 mm,  
September 13, 1907; No. 1567, 101 mm, September 12, 1907;  
Sulu Province, Bangau Island, No. 13597, 62 mm, April 17, 1926.

*MYRIPRISTIS MURDJAN* (Forsk.). Plate 4, Fig. 3

*Sciaenura murdjan* FORSKÄL, Descript. Anim. (1775) 48.

*Pomus murdjan* BLOCH and SCHNEIDER, Syst. Ichth. (1801) 85; LACÉ-  
PÈDE, Hist. Nat. Poiss., 4 (1802) 395, 118.

*Myrpristis murdjan* RÜPPEL, Atlas Poiss. N. Afrika Fisch. (1826-  
1831) 86. CUVIER and VALENCIENNES, Hist. Nat. Poiss. 3 (1829)

- 177; BLEEKER, *Nat. Tijdschr. Ned. Ind.* 3 (1852) 109; GÜNTHER, *Cat. Fish. Brit. Mus.* 1 (1859) 21; KNER, *Fische Novara Exped.* (1865-1867) 4; BLEEKER, *Ned. Tijdschr. Dierk.* 4 (1873) 188; GÜNTHER, *Fische der Sudsee* 2 (1873-1875) 82; DAY, *Fishes of India* 4\* (1873-1885) 190; SALVAGE, *Pois. Madagas.* (1891) 20; SEALE, *Oce. Papers B. P. Bishop. Mus. Hawaii* 1 (1901) 67; JORDAN and EVERMANN, *Bull. U. S. Fish. Comm.* 23 [(1903) 1905] 162; JORDAN and SEALE, *Bull. U. S. Bur. Fish.* 25 [(1905) 1906] 220; EVERMANN and SEALE, *Bull. U. S. Bur. Fish.* 26 [(1906) 1907] 60; JORDAN and RICHARDSON, *Bull. U. S. Bur. Fish.* 27 [(1907) 1909] 245; TANAKA, *Fishes of Japan* 4 (1911) 53; WEBER, *Fische Siboga Exped.* 1213 186; JORDAN and STARKS, *Ann. Carnegie Mus.* (3-7) 11 (1917) 417; WEBER and DE BEAUFORT, *Fish. Indes-Austr. Arch.* 8 (1920) 259-262.
- Myripristis parvidens* CUVIER and VALENCIENNES, *Hist. Nat. Poiss.* 3 (1829) 173; BLEEKER, *Nat. Tijdschr. Ned. Ind.* 3 (1852) 209; WEBER, *Fische Siboga-Exped.* (1913) 185.
- Myripristis valaceus* BLEEKER, *Nat. Tijdschr. Ned. Ind.* 2 (1851) 234; *Ned. Tijdschr. Dierk.* 4 (1873) 192.
- Myripristis microphtalmus* BLEEKER, *Ned. Tijdschr. Dierk.* 4 (1873) 191; JORDAN and SEALE, *Bull. U. S. Bur. Fish.* 25 [(1905) 1906] 220; EVERMANN and SEALE, *Bull. U. S. Bur. Fish.* 26 [(1906) 1907] 60; WEBER, *Fische Siboga-Exped.* (1913) 186.
- Myripristis adnata* BLEEKER, *Ned. Tijdschr. Dierk.* 4 (1873) 193; JORDAN and SEALE, *Bull. U. S. Bur. Fish.* 25 [(1905) 1906] 220.
- Myripristis bache* DAY, *Fishes of India* 4\* (1873-1885) 169, Suppl. 788.

Dorsal X, 1, 14; anal IV, 12, pectoral 15; ventral I 7. Lateral line 28 to 30; transverse line 10.

Height 2.2 to 2.6. Head 2.5 to 3. Eye 2.5. Interorbital space twice in eye; snout 3 in eye. Lower jaw slightly longer, with a rough, nipple-like projection on either side of symphysis, maxillary reaching to below posterior border of eye with blunt denticulations on its front near its lower end, teeth villiform in jaws, an external row of widely separated teeth which are larger and rounded, tongue without teeth, undersurface of lower jaw furrowed by ten or twelve grooves; maxilla pre-, sub-, and interopercles also grooved. Preopercle serrated in its whole extent. Opercle with a short strong spine, denticulated above this spine and along the whole of its outer margin, serrated below. Shoulder scale serrated. Upper surface of head with four raised lines subdividing each branch terminating in a small spine. Origin of dorsal separated by 7 to 9 scales from occiput. Dorsal spines increasing in length to third, third of equal length as sixth, interspinous membrane rather deeply emarginate, third anal spine strong but generally not much longer than

fourth spine, equal to eye; pectorals longer than ventrals a little less than head without snout; ventral spine equal to or longer than eye. Least height of caudal peduncle more than half diameter of eye. Caudal forked.

Alcoholic specimens yellowish brown; posterior membrane of operculum blackish, gill openings deep brownish black, axil of pectorals often black; a dark vertical band through eye, often confined to above pupil; dorsal, anal, and caudal fins with milky outer edges, a dark stripe present or absent at highest points of soft dorsal and anal fins, also at tip of caudal; seldom a dark mark along first dorsal; outer edge of ventral fins white.

*Distribution*.—Red Sea east coast of Africa, Malay Archipelago, Philippines.

The above description is based on specimen No. 14066, 130 mm, collected from Sibutu Island Sulu Province, April 27, 1926.

BATANES, Batanes Province, Santo Domingo de Basco, No. 12539, 165 mm, No. 27163, 140 mm November 3, 1925. LUTZON, Zambales Province, Subic No. 12013, 175 mm February 20, 1920. Manila, No. 10079, 131 mm, No. 10081, 155 mm, No. 17277, 135 mm No. 27441, 131 mm, 1911. Sorsogon Province, Bacon, No. 3227, 126 mm No. 3723, 170 mm, 1904. MINDORO, Mindoro Province, Caupan No. 15786, 80 mm, 1927. Puerto Galera, No. 7122, 122 mm, No. 7123, 112 mm, No. 7124, 133 mm, No. 7125, 145 mm, No. 7126, 134 mm No. 7196, 118 mm, No. 7197, 118 mm No. 7211, 120 mm, No. 7212, 115 mm, No. 7213, 105 mm, No. 7218, 115 mm, No. 7224, 130 mm No. 7671, 133 mm, No. 7674, 103 mm, No. 9227, 135 mm March to May, 1912. CEBU, Cebu Province Bantayan, No. 57367, 95 mm, No. 5772, 80 mm, May, 1909. PALAWAN Palawan Province, No. 12651, 38 mm, No. 27443, 51 mm, November, 1925. MINDANAO, Zamboanga Province, Zamboanga, No. 4173, 148 mm, May 26, 1908, No. 4248, 133 mm, 1908. Sulu Province Jolo, No. 2362, 93 mm, February, 1908; Mahajoc Point, No. 15661, 87 mm, No. 27480, 100 mm, No. 27481, 80 mm, No. 27482, 80 mm, No. 27483, 101 mm, No. 27484, 90 mm, No. 27485, 83 mm, No. 27486, 70 mm, No. 27487, 71 mm, No. 27488, 112 mm, No. 27489, 100 mm, No. 27490, 95 mm, November 10, 1927, Lubian Island, No. 15611, 120 mm, No. 15649, 130 mm, No. 15682, 85 mm, No. 27467, 95 mm, No. 27468, 102 mm, No. 27469, 98 mm, No. 27490, 112 mm, No. 27471, 117 mm, No. 27473, 118 mm, No. 27474, 90 mm, No. 27475, 108 mm, No. 27476, 86 mm, No. 27477, 90 mm, No. 27478, 112 mm, No. 27479, 122 mm, No.

27491, 124 mm, No. 27492, 114 mm, No. 27493, 112 mm, No. 27494, 130 mm, No. 27495, 106 mm, No. 27496, 113 mm, No. 27497, 116 mm, No. 27498, 125 mm, No. 27499, 131 mm, No. 27500, 113 mm, No. 27501, 133 mm, No. 27502, 131 mm, November 10, 1927. South Ubian Island, No. 14120, 71 mm, April 13, 1936, Sibaud, Lupak, No. 15617, 95 mm, No. 27453, 82 mm, No. 27459, 84 mm, No. 27460, 72 mm, No. 27461, 94 mm, No. 27462, 80 mm, November 8, 1927; No. 27445, 93 mm, No. 7446, 90 mm, No. 27447, 100 mm, No. 27448, 89 mm, No. 15757, 102 mm, November 8, 1927; Sibutu Island, No. 14068, 136 mm, No. 27449, 58 mm, No. 27450, 90 mm, No. 27451, 97 mm, No. 27452, 96 mm, No. 27453, 135 mm, April 27, 1926, No. 13722, 50 mm, No. 27442, 54 mm, April 26, 1926, No. 27440, 50 mm, No. 13693, 43 mm, No. 14066, 128 mm, April 27, 1926; Burgau Island, No. 13568, 122 mm, No. 27434, 83 mm, No. 27455, 49 mm, No. 27456, 91 mm, No. 27457, 90 mm, April 16, 1926, No. 11913, 73 mm, August 13, 1924, No. 14423, 155 mm, July 17, 1924. Davao Province, Samal Island, No. 3606, 70 mm, No. 3602, 75 mm, No. 3695, 130 mm, May 1, 1908.

HONOLULU, No. 27463, 140 mm.

*MYMPHISTIA SCHULTZEI* Seale, Plate 3, fig. 1

*Mymphistia schultzei* Seale Phil. Journ. Sci. 5: D 4 (1909) 504-505.

Dorsal X, I, 15; anal IV, 13; pectoral 15; ventral I, 6. Lateral line 28 to 30, transverse line 10.

Height 2.3 to 2.6; head 3 to 3.1. Eye 2 to 2.2, snout 7.5. Interorbital space about 3.3 in head, maxillary 1.80, posterior tip ending on a line with posterior margin of pupil, width of distal end about 2 in eye; pectorals 1.3. Ventrals 1.45 to 1.5.

Body oblong, somewhat compressed, greatest width at origin of dorsal. Upper and lower profiles of body about equal. Length of caudal peduncle 0.23 in head, its depth 3.2. Depth of head about equal to its length; interorbital space flat, with 4 longitudinal ridges. Anterior outline of head bent abruptly down in front of eyes, making a short blunt snout, the length of which is 2 in its width; maxillary reaching to below hind margin of eye.

Opercular bones denticulate, opercle with a single spine on its posterior margin, maxillary with small teeth on lower posterior border. Mouth large, oblique, lower jaw slightly longer, lower jaw with four distinct pores, two anterior front and two



at bottom of tip. Teeth in jaws, vomer, palatine, and on thyroid portion of tongue, two groups of four teeth each at tip. Gill opening very large, carried forward to below anterior margin of pupil. Gillrakers long, longest 2 in eye. Pseudobranchia present. Scales large toothed, body fully scaled; head naked except about 3 rows of scales on cheeks. Fourth dorsal spine longest, 1.9 in head; anal and soft dorsal practically equal, anal rays a little longer. Origin of ventrals midway between anal and anterior margin of eye. Caudal forked.

Alcoholic specimens yellowish white with some bronze reflections, darker above; fins uniform yellowish white; no opercular blotch; inner axil of pectorals deep black.

*Distribution*.—Philippine Islands.

The above description is based on the type specimen, No. 8899, 128 mm, collected from Samal Island, Gulf of Davao, May 4, 1908.

**MYRIPRISTIS FRALINI** Cuvier and Valenciennes, *Plat. 2, fig. 2*.

*Myrpristis probata* Cuvier and Valenciennes, *Hist. Nat. Poiss.* 3 (1829) 170; Bleeker, *Ned. Tijdschr. Ned. Ind.* 2 (1851) 293, 3 (1852) 262; Günther, *Cat. Brit. Mus.* 1 (1859) 20; Sauvage, *Poiss. Madagas.* (1891) 17; Jordan and Seale, *Bull. U. S. Bur. Fish.* 23 [(1903) 1906] 222; Weber and de Beaufort, *Fish. Indo-Austr. Arch.* 5 (1929) 253-256.

*Myrpristis scyodonta* Cuvier and Valenciennes, *Hist. Nat. Poiss.* 3 (1829) 128, 129; Sauvage, *Poiss. Madagas.* (1891) 12.

*Myrpristis bleekeri* Günther, *Cat. Brit. Mus.* 1 (1859) 20; Bleeker, *Ned. Tijdschr. Dierk.* 4 (1873) 179.

*Myrpristis vidua* Bleeker, *Ned. Tijdschr. Dierk.* 4 (1873) 183; Weber, *Fische Siboga-Exped.* (1913) 187.

*Myrpristis macrura* Günther, *Fische der Südsee* 1 (1873-1875) 93; Jordan and Evermann, *Bull. U. S. Fish Comm.* 23 [(1903) 1905] 149.

Dorsal X, I, 17; anal IV, 15; pectora 15, ventral 17; lateral line 36 to 40; transverse line 10.5.

Height 2.3 to 2.5. Head 2.75 to 3. Eyes 2.1 to 2.3. Snout equal to third of eye, interorbital space 1.75 of eye, one fourth in head; maxillary reaching to below hind margin of pupil, posterior edge with coarse distant spines, height posteriorly equal to half eye; tongue generally without teeth. Origin of dorsal separated by 8 or 9 scales from occiput, third dorsal spine longest, a little longer than diameter of eye, about twice as long as spine of second dorsal; third anal spine longest, equal to length of pectoral spine, pectorals equal to head without snout, longer than ventrals, ventral spine equal to diameter of

eye, about two times as long as pectoral; caudal deeply forked. Least height of caudal peduncle about two times in diameter of eye.

In life crimson red with golden reflection and with more or less distinct longitudinal bands on body, corresponding to rows of scales: lower part of scales rosy; opercular spot and base of pectoral dark brown, fins bright rose. dorsal caudal and ventral all edged with white; first dorsal deep red, paler at base.

*Distribution*.—Madagascar, New Guinea, Red Sea, Ceylon, Ireland, Samoa, East Indies, Philippines.

The above description is based on specimen No. 15653, 98 mm collected from Mahahoe Point, south coast of Jolo, November 10, 1927.

LUZON Sorsogon Province, Bacon, No. 3223, 128 mm, 1904  
MINDANAO, Sulu Province Mahahoe Point, south coast of Jolo  
No. 27464, 83 mm November 10 1927

## ILLUSTRATIONS

[Drawings by A. Laguna. The scale given with each figure equals 1 cm. except that in Plate 4, fig. 1, which equals 2 cm.]

### PLATE 1

- FIG. 1. *Holocentrus ruber* (Forsk.)  
2. *Holocentrus opercularis* (Cuvier & Valenciennes)  
3. *Holocentrus lacteo-guttatus* (Cuv. & Val.) M. Weber

### PLATE 2

- FIG. 1. *Holocentrus ruber* (Forsk.)  
2. *Holocentrus cinnamomus* (Bleeker)  
3. *Holocentrus violaceus* Bleeker.

### PLATE 3

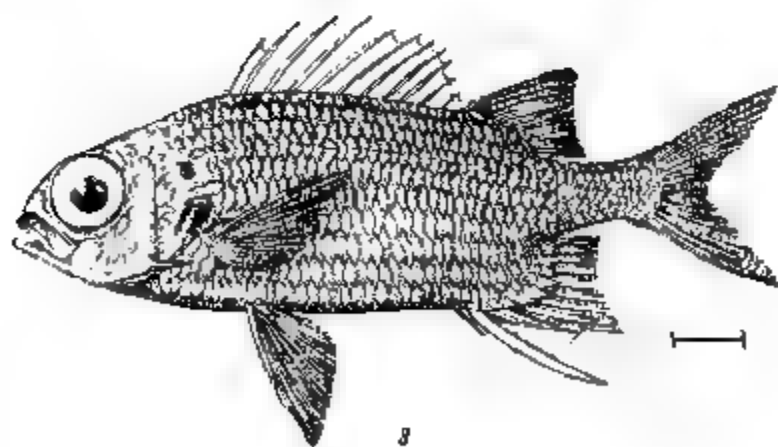
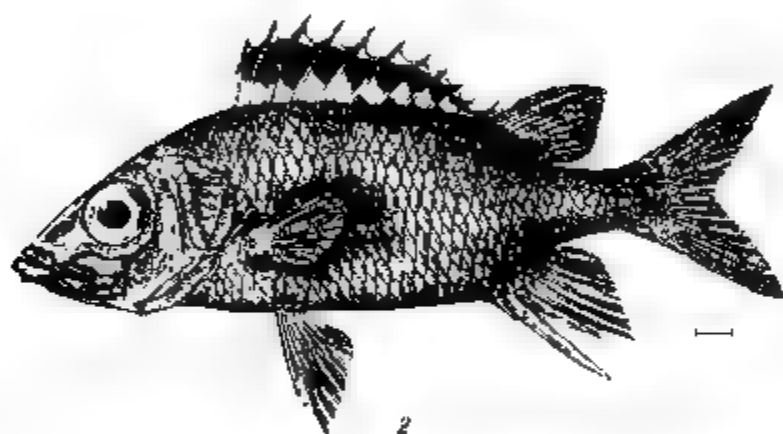
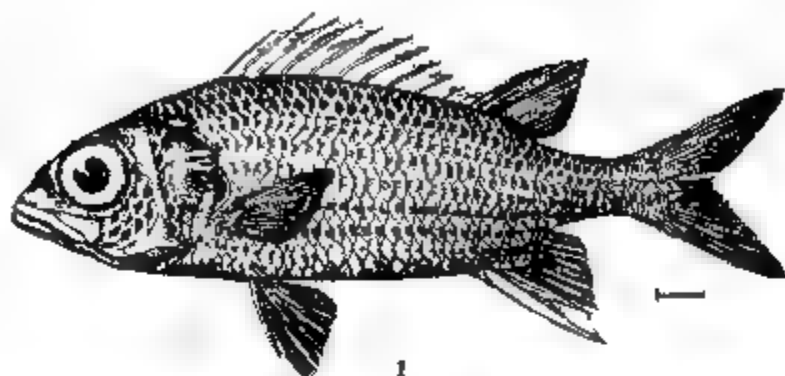
- FIG. 1. *Holocentrus sandincentatus* Rüppel.  
2. *Holocentrus thalassius* Lacépède.  
3. *Holocentrus bleekeri* M. Weber.

### PLATE 4

- FIG. 1. *Holocentrus sparsifer* (Forsk.)  
2. *Myripristis melanostictus* Bleeker.  
3. *Myripristis murdjan* (Forsk.)

### PLATE 5

- FIG. 1. *Myripristis schultzei* Seale.  
2. *Myripristis prolatus* Cuvier and Valenciennes.



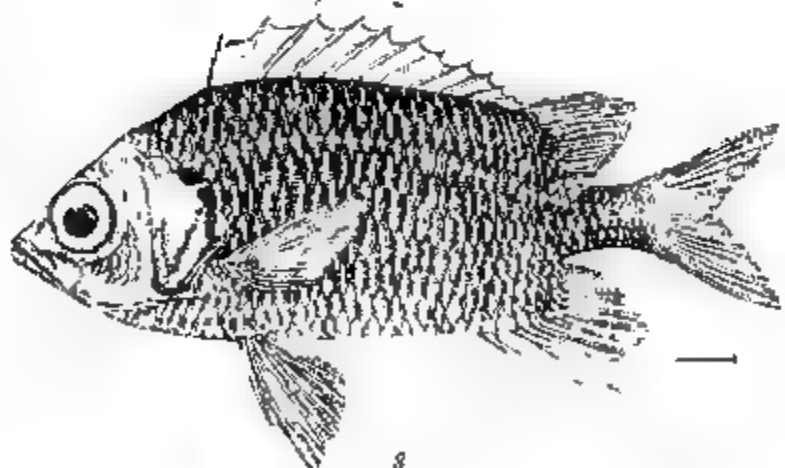
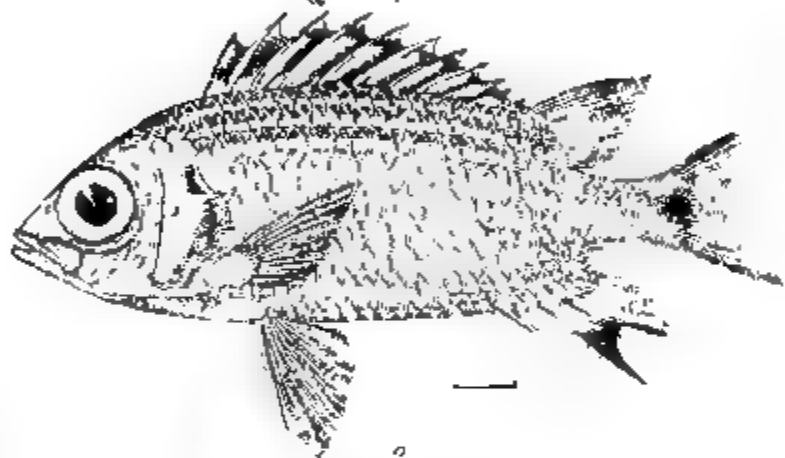
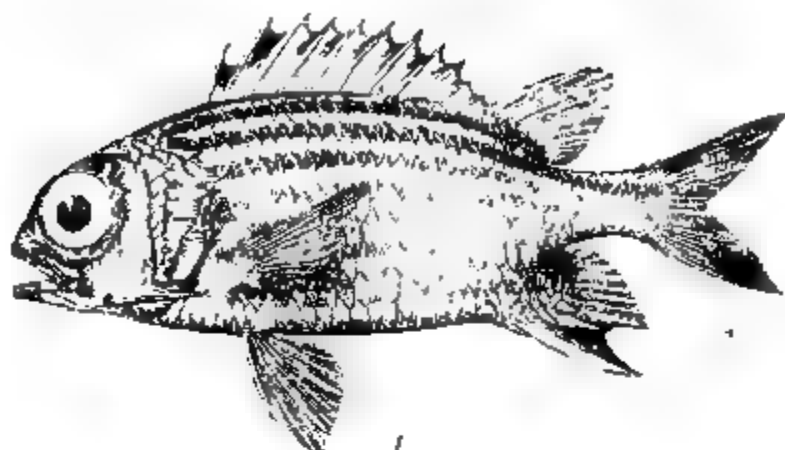


PLATE 1

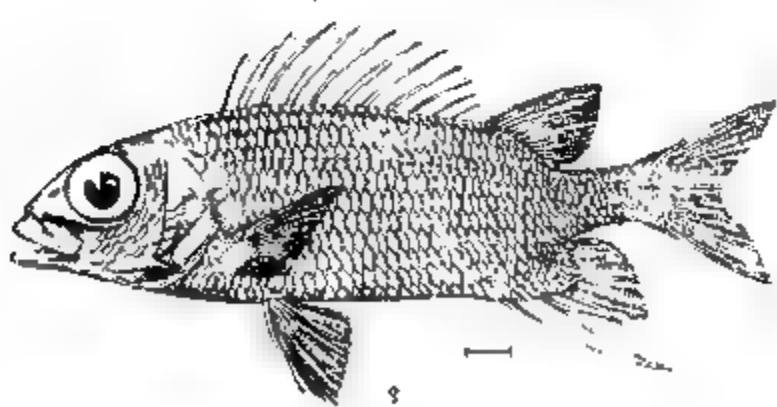
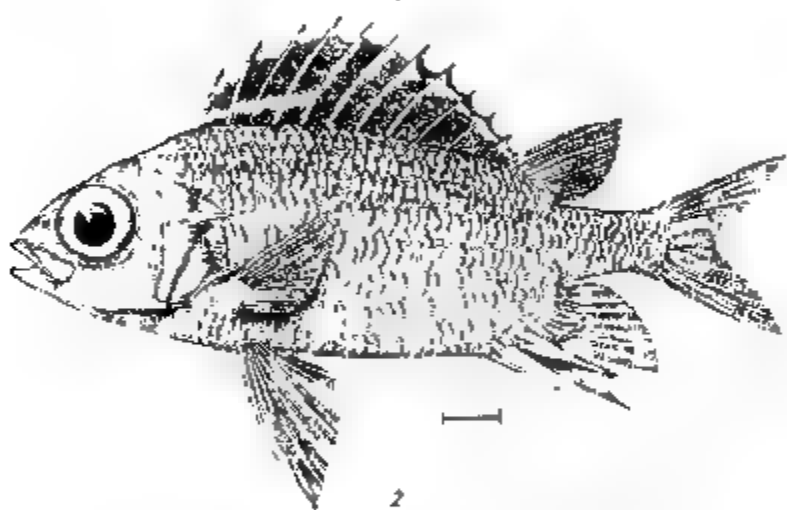
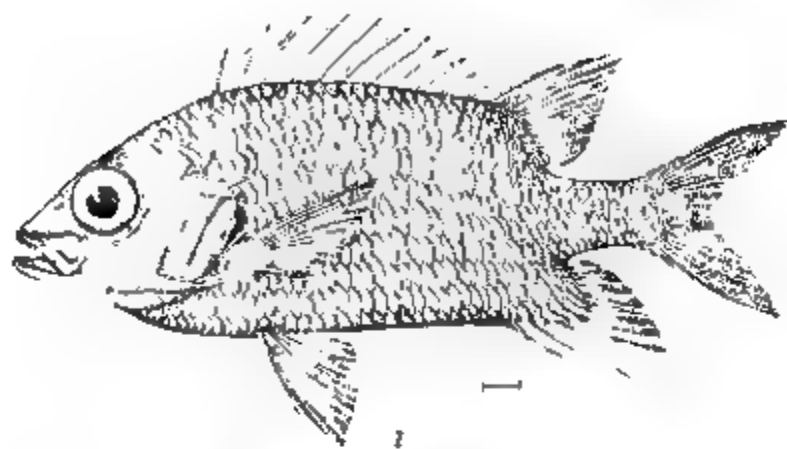
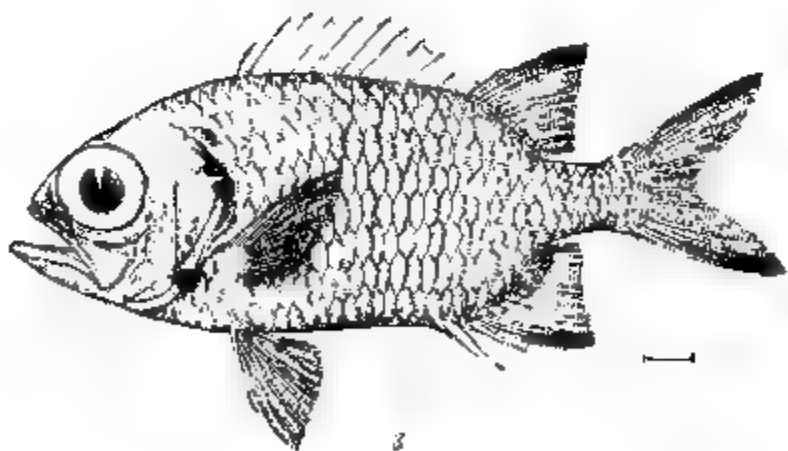
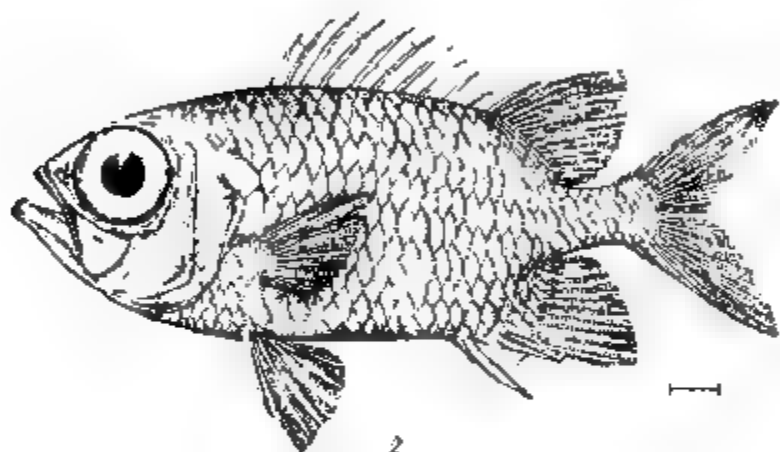


PLATE 2



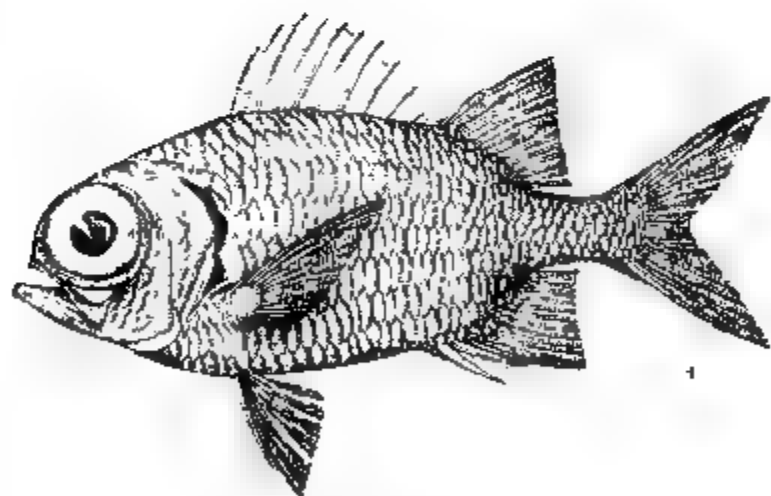
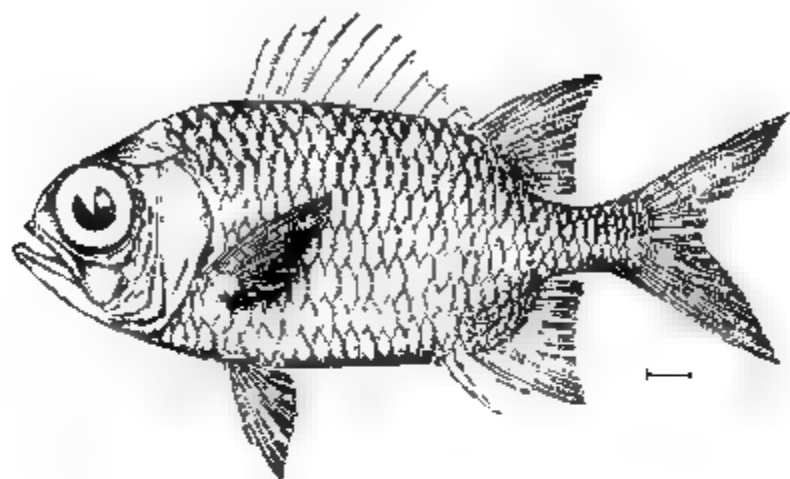


PLATE 1.



## BOOKS

Acknowledgment of all books received by the Philippine Journal of Science will be made in this column, from which a selection will be made for review.

REF: vrb

- As you like it.** Chas. Sherrill. 60 pages. 1938. Published for the  
Theatre Guild by The Theatre Guild, New York City. Price \$1.00.  
**CITY OF NEW YORK.** 1938. 119 pp., illus.  
**EARTH.** In Gong, and L. Noel Braxton. Men, medicine and fear in  
the U. S. S. R. London, Lawrence and Wishart, 1938. 173 pp.  
Price 4s.  
**CURT, NOEL B.** Child psychology. Longdale Kentucky, The Standard  
Printing Co. 1937. 299 pp., illus.  
**DENNERBERG, OTTO.** Verzeichnis & Lautlehre des Australo-asiatischen Wort-  
schatzes. IIter Band, Australo-asiatisches Wörterverzeichnis. Berlin  
Deitrich Reimer (Andrew & Steiner), 1938. 102 pp.  
**GREAT BRITAIN.** Ministry of Health. Report of an investigation into ma-  
larial mortality. Presented by the Minister of Health to Parliament  
by command of His Majesty April, 1937. London, His Majesty's Sta-  
tionery Office, 1937. 353 pp., maps, diagrams. Price, 5s. 6d.  
**HENTIG, HANS VON.** Punishment: its origin, purpose and psychology.  
London, William Hodge and Company, Ltd. 1937. 239 pp. P. co.  
12s. 6d.  
**LAWRENCE, W. J. C.** Practical plant breeding. London, George Allen &  
Unwin, Ltd. 1937. 155 pp., illus. Price, 5s. 6d.  
**League of Nations.** Health organization. The treatment of malaria.  
Study of synthetic drugs as compared with quinine, in the therapeutic  
and prophylactic of malaria. Fourth general report of the Malaria  
Commission, and appendices. Geneva League of Nations 1937. 558  
pp., illus. Price, \$0.65.  
**A symposium on cancer.** Addresses by Leiv Kreyberg, Carleton C. Lit-  
tle, Mudge T. Macdon, Edgar A. Mc, Howard B. Amerson, James  
Boeing, Giacchino Fatta, Henry Comard, Warren H. Lewis, Stanley  
P. Robinson, James B. Murphy, and Emil Novak. Given at an Insti-  
tute on Cancer conducted by the Medical School of the University of  
Wisconsin. Madison University of Wisconsin press 1938. 203 pp.  
illus., graphs. Price, \$7.  
**TYRRELL, ALFRED HENRY.** Sex satisfaction and happy marriage. By the  
Reverend Alfred Henry Tyrrell. Foreword by Robert L. Dickinson.  
New York, Emerson Books, Inc. 1933. 160 pp., illus. Price, \$2.  
**VEBELL, A. HYATT.** Foods America gave the world. Boston, L. C. Page  
& Company 1937. 280 pp., illus. Price, \$2.

WALTON, DASHLEY GREENE. The construction of a plan to appliances for applying reason to lesions of the cerebral cortex. 1935. 100 pp. and 100 pp. foreword by W. W. D. Jones. London: Published for the Medical Research Council by John Murray, 1935. 11 pp. 10s. 6d. Price 10s. 6d.

#### REVIEWS

*Personality and the Cultural Pattern.* By James S. Plant. New York: The Commonwealth Fund, 1937. 322 pp. Price \$2.50.

One of the most recent books dealing with personality is that of a physician and psychiatrist, Dr. James S. Plant, Director of Essex County Juvenile Clinic, Newark, New Jersey. All mental men are more and more concerned with personality problems. This task used to be left to psychologists, who are usually without practical training, or to psychiatrists with very little psychological insight. Doctor Plant is a physician, but also a psychologist, and also a psychiatrist and a sociologist.

The book presents a new approach to the problem of personality. Formerly attention was directed largely to the inner motives of individuals and less to their environment, or it was thought that an individual may change his environment. In discussing the main concepts of the personality, Doctor Plant reverses the approach with the hypothesis of psychosociosis, which "is that the 'self' about the personality is highly permeable and that there flow into the personality currents of environmental influence which eventually affect the existing content." The view presented therefore is "that environmental forces can change the personality."

The view is not however entirely new. Such an approach to the study of personality was suggested long ago by the behaviorists, though for some reason the psychologists have not taken the cue very seriously. Credit is given to Doctor Plant for having formulated definitely this new approach to the understanding of personality. As the title of the book suggests, personality is the result of the interplay between the individual and his environment or his cultural pattern.

The book itself is a discussion of the structure of personality and the conflicts between personality needs and the environmental pressures. It discusses such topics as the effect upon personality development of the family pattern, urban and sub-urban life, school, church, law, medicine, industry, and education. Space prevents the reviewer from presenting the salient facts brought out by Doctor Plant. The reader, however, will do

will to read this very interesting book not only once but several times if they want to get the most out of it.

In this country, where we are just awaking to the needs of our developing personalities presented in our youths, where we begin to feel concern for our juvenile delinquents and where we await the lack of religious and moral education of our children, it would indeed be very profitable for us to read Doctor Plant's illuminating book. Psychiatrists, psychologists, sociologists, mental hygienists, educators, and a host of others interested in personality development should find this book very delightful reading.—S. G. P.

The American Kennel Club Blue Book of Dogs 1938. Published for the American Kennel Club by the Garden City Publishing Co., Inc. Garden City, New York. 120 pp.

This volume lists the outstanding winners on bench shows as well as racing, field trials, and obedience work of some eighty breeds of dogs during 1937. The pedigree, the owner, and a brief description of each champion animal are given. The book is profusely illustrated, and serves as the latest photo news of the best specimens of dogdom. This work is specially valuable to breeders and owners of dogs, and to some extent to veterinarians as well. It is produced on good quality paper.—L. M. Y.

Maternæ Medicæ, Toxicology and Pharmacognosy. By William Montfield. St. Louis, The C. B. Mosby Company, 1937. 70 pp. illus. Price, \$6.75.

This volume is a text and reference book on the therapeutics, toxicology, pharmacognosy and posology of drugs that are officially listed in the United States Pharmacopoeia XI and the National Formulary VI. There are twenty chapters devoted to the materia medica and pharmacognosy of vegetable drugs or their products, classified according to the parts used or the kind of plant product, one chapter pertains to drugs of animal origin, five chapters contain discussions of poisons classified mainly into caustics, irritants and systemic poisons, and one chapter deals with posology. A glossary of medicinal and botanical terms is appended.

The introductory discussions in each chapter, the inclusion of pharmacognostical information essentially required of each drug, and the excellent figures make the volume a valuable handbook.

The doses of U. S. P. and N. F. drugs, arranged both from the lowest to the highest and alphabetically, should prove of value.—P. V.

Strange Reptiles and Their Stories. By A. Hyatt Verrill. Boston, L. I. Page & Company 1937. 195 pp. Iron, spine, cloth. Price, \$2.50.

This book is intended primarily for youthful and adult readers interested in the general aspects of the subject, so that technical terms have been avoided and no attempt has been made to classify or arrange the reptiles in their scientific groupings. The interesting ways and habits of reptiles are featured. Selection has been made of the commoner and more noteworthy species and those of particular importance. Facts about these animals are given, to do away with many popular fallacies, and the strange and ridiculous beliefs and superstitions connected with them. Included are a number of narratives of personal experiences of the author, together with incidents and anecdotes of other well-known travelers, explorers, and scientists. Exceptionally good and quite accurate drawings of a good number of the reptiles included in the book serve as a guide in identification of reptiles.

The book should prove of great interest and help to laymen, especially those who because of lack of scientific training would find treatises written in highly technical and scientific terminology difficult.—D. V. V.

Manual of Rubber Planting (Malaya). Compiled by A. T. Enear. Kuala Lumpur, F. M. S., The Incorporated Society of Planters, 1937. 311 pp., illus. Price, 50 (Straits Currency).

This book presents a comprehensive guide for the convenience of rubber growers. It embraces all conceivable phases of rubber planting, manufacturing and shipment of rubber, and similar vital information on a number of subjects that rubber growers find very useful.

Part I deals with land tenure in the Federated Malay States, how to select rubber land, with descriptive sketches on the different types of soil and altitudes where rubber should be grown in Malaya; the opening up of an estate, including the clearing of jungle and colonial lands, such as felling, burning, clearing and the like, sites for buildings, such as factories and employees and laborer's quarters; laying of the land, soil conservation, selection, breeding, and propagation of planting materials; upkeep of young as well as old rubber plantations, maintaining control of pests and diseases, tapping and collection of latex, preparation of smoked sheets, spray, rubber, and crepe.

Particular mention should be made of Sections 4, 5, 7, 8, and 12 of the manual, wherein the author discusses with thorough

ness the advantages and disadvantages of budgrafting, the importance of Para rubber and the subsequent care of same, the high-yielding clones of which are now revolutionizing the rubber industry in Java, Sumatra, and Malaya. A list is given of clones that are suitable for planting in certain sections in Malaya. The author claims that the production of seeds by crossing is inadvisable on a commercial scale, due to the disadvantages experienced by the planters in planting clonal seeds.

Section 7 discusses at length the tapping systems in vogue in Malaya and the advantages and disadvantages of each one of them as well as on old Para rubber trees. In Section 8 the names of the different weeds and diseases attacking Para rubber are listed, including pointers on how to identify them in the field, together with the necessary control measures. In Section 12 the manufacturing of raw rubber, including the descriptions of smoke houses, the production of standard smoked sheets and crepe and spray rubber; and the preservation and testing of latex for export purposes are clearly outlined in detail.

Part 2 embraces some notes on estate sanitation for planters and laborers, such as housing, the collection of waste, water supply, sewage disposal and purification and the prevention of some diseases. This part of the manual includes also the first-aid measures necessary for snake and dog bites, labor conditions and laws, organization of cooperative societies; estate records; road making, construction of buildings, use of concrete, survey instruments, and equipment, and weights and measures and their equivalents, which are all essential in farm practice.

The manual would certainly be useful as a guide not only for the rubber growers or those contemplating to engage in this industry but also for the planters of other crops.—F. C. G.

**Butter and Oleomargarine: An Analysis of Competing Commodities.** By W. R. Pobst. New York, Columbia University Press, 1937. 112 pp. Price, \$1.50.

The purpose of this book, according to the author is to investigate the interrelationships of butter and oleomargarine "in the light of recent theoretical work and through the application of modern statistical technique."

The competition between butter and oleomargarine dates back to 1870, when an oleomargarine factory established in Paris started the commercial production of oleomargarine. The dairy industry, especially the production of butter, is being continually threatened by the competition of artificial butter made from

vegetable oil. By the end of the nineteenth century the oleomargarine industry had already established itself in the United States and offered stiff competition to the butter industry. In all the oleomargarine produced in the United States at present, however, is manufactured by the oleomargarine manufacturers. A substantial amount of this product is manufactured as a second product in the manufacturing plant of other industries.

Because of the keen competition of oleomargarine with butter the dairy industry has been continually agitating for the enactment of laws that would restrain competition and handicap the producers of oleomargarine. Even during the latter part of the nineteenth century state laws were passed against oleomargarine, as a part of the legislation against fraud. The adulterant sale of oleomargarine and its use in the adulteration of butter have greatly affected the butter industry, so that nothing short of a federal law was needed to establish fair competition between these two industries.

The increased consumption of oleomargarine during the World War has greatly stimulated the industry. The dislocation of agriculture in the United States was attributed partly to the oleomargarine industry, and there has been increased agitation on the imposition of high tariff on butter. The tariff on butter had also the effect of increasing the price of oleomargarine and indirectly benefited the manufacturers of this product. The use of coconut oil in the manufacture of oleomargarine has increased the opposition of the latter producers who claim that oleomargarine made out of coconut oil is a foreign product and they resent the competition of the "Philippine cow" with the American variety.

Dr. W. R. Patst in Chapter III of this treatise, gives an very interesting relationship between butter and oleomargarine as competing commodities. The use of diagrams would have greatly improved the presentation of this aspect. The latter producers led by the National Coöperative Mill Producers' Federation are continually advocating the exciseation of butter taxes on all kinds of oleomargarine as well as the imposition of an excise or processing tax on all imported fats and oils used in the United States. As a result of this agitation coconut and other imported oils are now subjected to excise or processing taxes, and to taxes on oleomargarine containing foreign oils. In the Revenue Act of 1931, the United States imposed a tax of

5 cents on coconut oil coming from foreign countries and 3 cents on Philippine coconut oil. As a result of the imposition of this tax, cottonseed oil, which is a domestic product, is being used increasingly in the manufacture of oleomargarine. The effects of the tax on oleomargarine to equalize competition with butter cannot be determined accurately, and the author points out that it would tend not to equalize competition but to distort it further.

Those who have preconceived ideas about protecting the butter industry by imposing taxes and other restrictions on the manufacture of oleomargarine would do well to examine this important work on the subject. There is a good bibliography with court decisions at the end of the book.—A. V. G.

*Ceramic Data Book* Featuring Equipment and Materials Catalogs, Also Buyer's Directory. 10th ed. Chicago, Industrial Publications, Inc., 1938. 202 pp., illus. Price, \$5.

As stated in the foreword, this book is "the engineering and purchasing handbook of the ceramic and clay products industries. It is published annually and distributed to all plants in these industries, with the sole purpose of placing accurate, up-to-date information before the operating executives in a handy and readily available form."

The book is divided into three sections. The catalog section contains the buyers' directory, and equipment and materials. The editorial section includes a review of important developments in the glass, enamel, ware, clay products, and refractories industries. The handbook and data section gives a compilation of tables, charts, definitions, and data that ceramic manufacturers and technologists have frequent occasion to use. The book has a detailed index at the end. The index to firms represented in the catalog section is at the front of the book. A list of books on the subject is given at the back.—F. D. M.

*Qualitative Analysis and Chemical Equilibrium*. By T. R. Hogness and Warren C. Johnson. New York, Henry Holt and Company, 1935. 417 pp., illus. Price, \$2.55.

This book is an important addition to the long list of qualitative chemistry textbooks.

It gives a brief yet clear exposition of the properties of solids, liquids, and solutions which are necessary for the proper understanding of reactions in solutions. The schematic and graphical treatment of certain points, as polarity of molecules, law of mass action, and the like, is very effective. The emphasis on

chemical equilibrium and experimental technique involving the use of small quantities of substances fills the modern need in modern qualitative work for reorientation as regards subject matter and object. The procedure differs from the system of Fresenius only in that it starts with the soluble group.

The trend in analysis of using small amounts of materials should be welcomed, as it is conducive to rapid analytical work; also care and neatness in the carrying out of procedures. It still remains to be seen, however, whether the change from the micro- to semimicro technique is desirable for elementary courses.

The book may be suitable as a textbook for students who have taken a brief course, say a semester, of general chemistry.

—F. L. R.

*Basic German for Science Students with Vocabulary and English Translations of the German Passages.* By M. L. Barker. 2d. ed. Cambridge, England, W. Heffer & Sons Ltd., 1937. 186 pp. Price, 6s.

This book is primarily designed for "reading knowledge" of German or ability "to give in English the gist" of writings in German on scientific subjects. It appears that all that is required for this ability is knowledge of German grammar reduced to an "absolute minimum" and familiarity with "a vocabulary of approximately 650 of the first thousand basic German words."

Part I consists of general passages, with six introductory lessons and exercises covering the special "grammar" study regarded as necessary. The plan of each lesson is consistent. At the head of each lesson come a few verses from chapter 1 of Genesis, the first "general passage," with the German and English texts opposite each other on the same page. In the selection of the basic vocabulary from the verse passages the arrangement is identical in all lessons. First are listed nouns, then verbs, prepositions, adjectives, and miscellaneous words; the nouns are given with their articles in all forms and the verbs are classified and presented with their principal parts. The grammar is essentially functional, in that it is based on actual usage. Besides this functional grammar there is a section on "word order." At the end of each lesson is an exercise on vocabulary and grammar. Here the student is required to translate simple English sentences into German or to decline nouns with articles and attributes. The other general passages deal with the history of civilization. An English translation of each selection is given on the opposite page. These texts are selected from the standpoint of chronology, completeness, and interest. Professor



Barber believes that his general passages contain the required basic vocabulary or "those words which are actually of most frequent occurrence in the writings of the German people."

Part 2 is a collection of extracts of writings in German in the various scientific fields including chemistry, zoology, botany, physics, mathematics, and medicine. As in Part 1, the English translation of each passage is printed on the opposite page, and the basic vocabulary is collected at the foot of the page in the order of appearance in the text. In both Parts 1 and 2 the total number of basic German words listed is approximately 1372. It may be pointed out that the alphabetical glossary at the end of the book is much fuller than the listed "basic vocabulary."

On the whole, I believe, the book will serve its purpose. The method of selecting the basic vocabulary seems logical, and perhaps adequate. However, the sufficiency of the "reduced" grammar, I am inclined to think, is open to question. Though the points of grammar considered may be adequate as far as they go, still much may be lacking even for "reading knowledge." There is hardly anything on participial construction, and there is very little on sentence structure and word composition. Because of the conciseness of these forms, German scientists use them constantly in their writings. Familiarity with these forms is essential to a student who wishes to translate scientific German with facility and accuracy.

Finally the ready accessibility of the English versions of the texts may develop the line of least resistance in the student. Instead of stimulating learning, the English translation may entirely do away with the effort to learn, or induce the student to take too many things for granted. From a pedagogical point of view the "Appendices" containing German passages set in certain examinations given in English universities may result in greater learning power as exercises in retranslation. In my experience vocabulary building means constant use of the dictionary by the student.—R. N.

*Wind-Pressure on Buildings. Experimental Researches.* By J. O. V. Ingmager and Chr. Nørlund. Translated from the Danish by Alexander C. Jarvis and C. Brødsgaard. First and Second Series. København, Denmark: Naturvidenskabelige Selskab, 1930, 1936. 2 vols., illus., plans, diagrams. Price, 20 Kr.

The first book contains records of experiments conducted on bodies subjected to air current in a wind tunnel designed for

the purpose. The descriptions of the apparatus used and the description of the tunnel itself, together with the necessary accessories and connections, are given in detail and with photographs. The results of pressure measurements made at different points of the models are given in graphical form. The various shapes subjected to air current consist of plane surfaces and solids. Circular discs varying in diameter from 50 to 70 cm and rectangles and triangles of various dimensions were used. Among the solids used were spheres varying in diameter from 50 to 100 cm, cylinders of from 6 to 40 cm diameter, and prisms, pyramids, cones, and cubes of different dimensions.

In the second book are contained studies on models of partly open buildings and of buildings without any walls, and screens with and without perforations which were subjected not only to air current produced in the wind tunnel but also to natural wind. The authors made stream-field measurements in addition to pressure measurements. Photographic records of stream lines around the models are given. An Appendix giving the mathematical treatment of the results of the investigations upon stream fields surrounding buildings is included.

With the exception of this mathematical appendix, the books can be easily understood by average readers.—C. A. O.